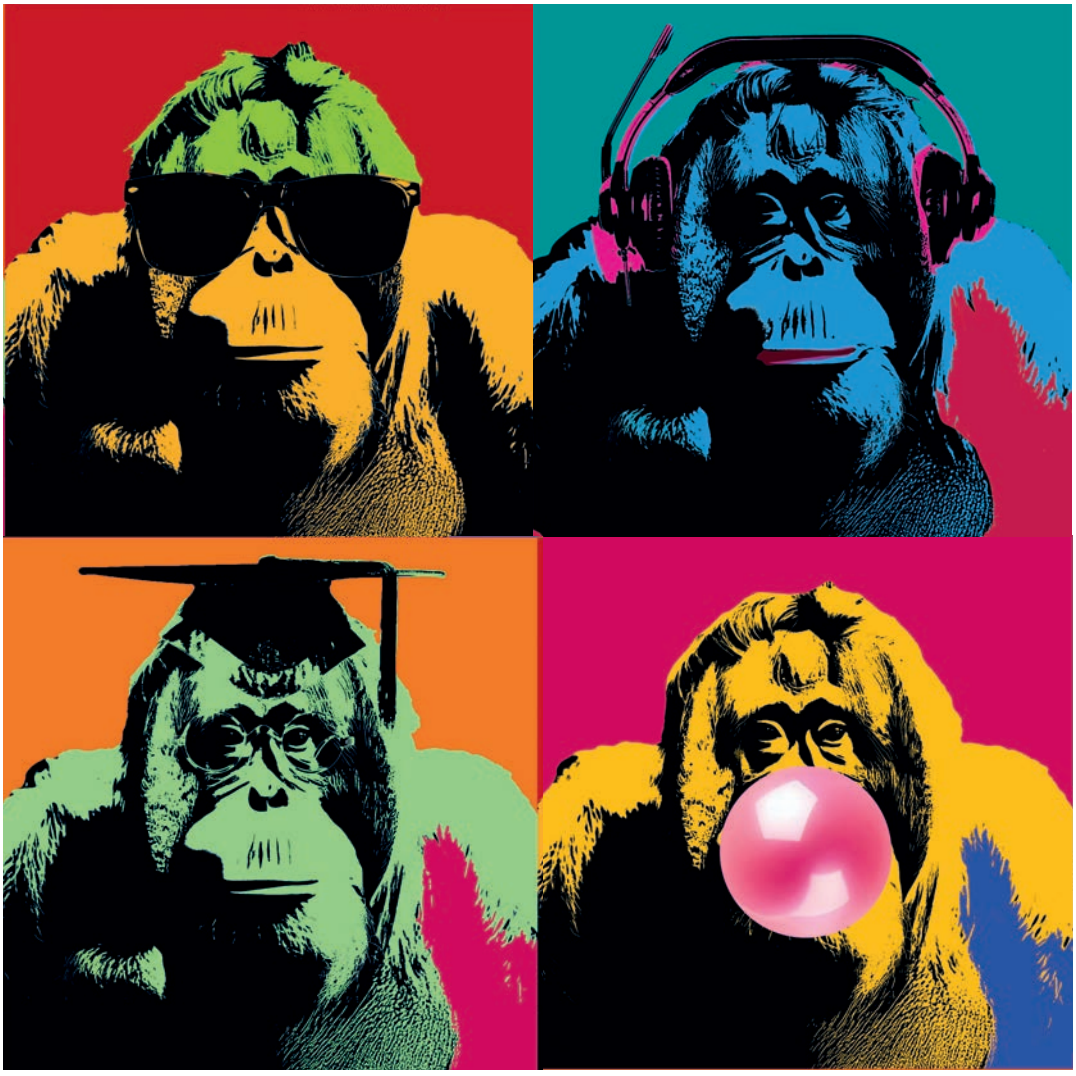
Batteries International

September 2-5, 2025 Kota Kinabalu, Malaysia



The four faces of 21ABC

International Lead Medal: winners over the years

The ONE Minute Giveback: let's spread the love

Full listing of speakers, agenda, exhibitors, booths

Asia ahead of the game: regional triumphs await

THE WAY WE WERE ... ABC OVER THE DECADES

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CONTENTS

21ABC Yearbook & Special Pre-2025 Conference Report

Publisher
Michael Halls
editor@batteriesinternational.com
+44 7977 016 918

Editor
Shona Sibary
shona@batteriesinternational.com
+44 7979 507 288

Researcher
Matthew Halls
matthew@batteriesinternational.com

Finance administrator
Juanita Anderson
juanita@batteriesinternational.com

Subscriptions, enquiries
subscriptions@batteriesinternational.com
admin@batteriesinternational.com

Production/design
Antony Parselle
aparselledesign@me.com

International advertising representation
advertising@batteriesinternational.com

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Come and visit us at Booth no. 51

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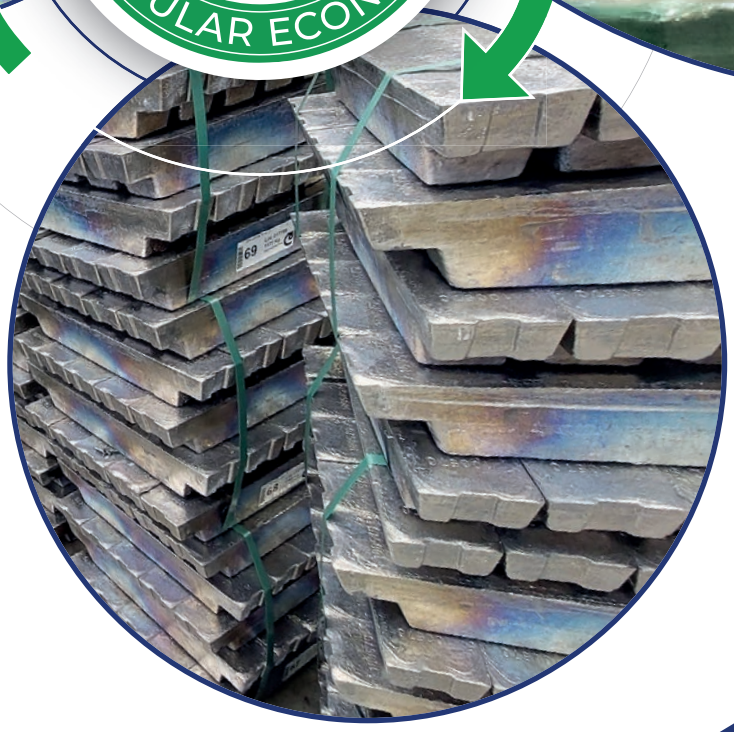

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Mike Halls • editor@batteriesinternational.com

Finding the right path in ever more troubled times

History doesn't repeat itself but ... often it rhymes. Not necessarily a deep thought from Mark Twain but a relevant one, for this year's ABC Convention.

The fact is — and it's being screamed from every media outlet on the planet — we are living in a period of unprecedented turmoil. Even the use of the word unprecedented is just that … unprecedented.

A Google search reveals that the news combination of "tariff" and "turmoil" or "tariff" and "disruption" throws up more than 6,000 articles in English alone in the past week. One commentator reckoned the word "tariff" had even hit the headlines of every single broadsheet newspaper across the world.

So history may not br repeating itself but there are echoes of the past relentlessly repeated by the media that are strikingly elevant.

The stock favourites have come out of the closet. It's time to talk about The Great Depression, the run-up to a World War, and that's not forgetting Inflation, Deflation, Reflation, Hyperinflation and, for those single experts wanting a lads' night out, Stagflation, to boot. (Moreover, capital letters are needed too, just to emphasise that this is a Serious Subject.)

It's not the place of this editorial to discuss the reasons or possible solutions. Rather, to simply point out that this is a battery industry challenge that should be prioritised on any convention agenda.

Especially so, to a predominantly Asian audience which finds itself caught in the middle of a trade war between the US and China. (And apparently the US and the rest of the world.)

For the lead battery industry this turmoil comes after a tremendously difficult five years. A still disrupted supply chain and a slowdown in globalization, evident since the start of the Covid epidemic, has been taken to a new level. Globalization has become Regionalization with both attendant benefits and negative repercussions.

Whatever the merits or dismerits of tariffs there is a different market environment emerging. Moreover, it's not just nudging us in a different direction but smacking us in the face.

First is that irrespective of whether protectionism will benefit the US, the battle for business has moved firmly away from the West. Of the around $53 billion of lead batteries sold each year in the world roughly $7 billion is sold in the Americas, $7 billion in Europe with around $35 billion of sales coming from Asia.

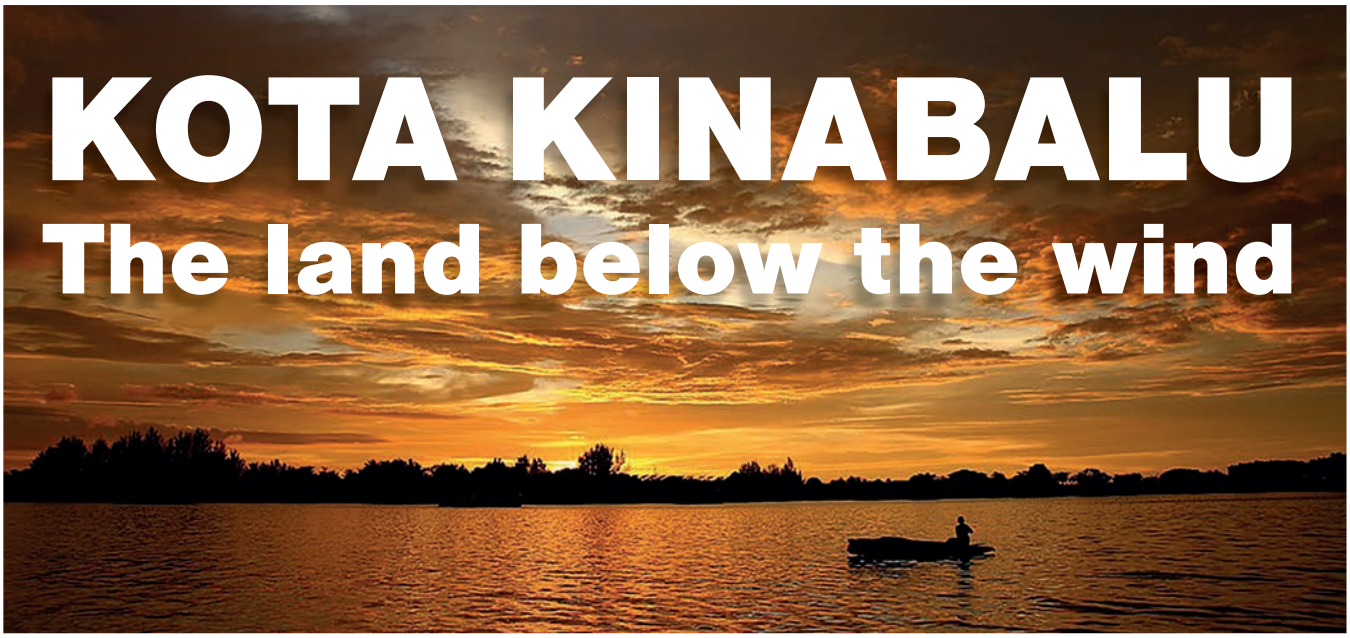
A new generation of lead battery giants is emerging. Firms that were large are now expanding rapidly. In the lead battery world think India's Amara Raja, Exide Industries or China's Leoch. In the lithium world giants such as Panasonic and LG Chem are being outstripped, seemingly effortlessly, by CATL and BYD.

This year's ABC offers a forum to move away from the tiresome will-he, won't-he discussions on tariffs by trying to assess what the new battery landscape for Asia and the region's international sales will look like. This year's ABC will allow us to gather the thoughts of the other delegates during its networking sessions and coffee breaks.

But let there be caution believing the hype. "Whenever you find yourself on the side of the majority, it is time to pause and reflect."

Yes, Mark Twain liked to have the last word too.

Mike Halls,
Publisher



KOTA KINABALU
The land below the wind

As we all congregate in the exotic location that is Borneo, *Batteries International* shares everything you need to know about primates, poachers and palm oil ...

We're a close-knit bunch here in the lead battery world and as we all gather together in Kota Kinabalu for one of the industry's most illustrious conferences, we should take a look around us at the similarities we share with our fellow folk.

For a start, there's our intelligence. No doubting the smarts are on Borneo this week! Then there's an abundance of soft skills — patience, observation and inquisitiveness. Plus, we all have opposable thumbs and big toes and — bear with us here because we promise we're not clutching at straws — bodies covered in hair, not fur.

But the greatest likeness of all, aside from a collective obsession as to whether a lead battery will ever achieve a 5000 charge/discharge cycle at an affordable price, is probably our sophisticated ability to recognise our own reflections in a mirror and adjust our clothing accordingly.

We're talking, of course, about our closeness to Borneo's most famous resident — the orangutan. So alike are we, that you may be surprised to know that we actually share an astonishing 97% of DNA with these great apes.

Joking aside, it's impossible to escape orangutans on a trip to Borneo. (Well, we hope you don't actually HAVE to, especially if you're playing it safe and hanging out in the Hilton foyer). We're talking figuratively because they're the only Asian representative from the ape family and reside almost entirely on this island. Each of the other four apes — gorillas, chimpanzees, bonobos, and humans — all hail from Africa.

In Malay and Indonesian orang means 'person' and utan is derived from hutan, which means 'forest'. Thus, orangutan literally means 'person of the forest'. For the Latin speakers among us you're probably be more familiar with it as *Pongo Pygmaeus*.

But you'd have to have been living in a hole over the last decade to not know that these primates are critically endangered because their rainforest habitats are disappearing faster than the drinks at an industry shindig.

Kota Kinabalu is Malaysia's gateway to the jungles, beaches and mountains of Borneo and an untapped, untrammelled and mostly unexplored world of raw nature.

Kota Kinabalu's eye-catching roundabout includes a massive Marlin splashing from the center of the roadway near the city center

Forget the batterymen and women that will be attending this year's ABC, the real wildlife starts only a few steps away from the conference doors.

Borneo is the third largest island in the world — Greenland is top, New Guinea second and Australia is a continent (obviously!) — with vast swathes of jungle that are still effectively virgin nature.

There's an irony to Borneo's size. The island is home to the famous Bornean pygmy elephant — the smallest in the world. They're about a metre smaller than other species but they still pack on the pounds — weighing in at around 2.5 tonnes.

Like so much wildlife around the planet they're also under threat of extinction in their natural habitat. Deforestation is rampant across Borneo. In the 1980s around three-quarters of the island was jungle, now it's around half. Logging cuts the water resources available to these elephants and they need a lot, as much as 225 litres a day.

The jungle is also home to the smallest and possibly the cutest of the eight bear species in the world — the Bornean Sun Bear or, if we want to continue to talk Latin, the *Helarctos Malayanus*. These are typically less than a metre high and weigh up

to 65kg (140lb). There's only around 10,000 of these animals left and they're under threat from poachers who hunt them for their meat as well as sell them as pet illegally.

The rainforest itself dates back some 130 million years — that's about twice as old as that in the Amazon — and there's an incredible array of wildlife including 15,000 identified plant species, 3,000 types of trees, 222 land mammals and 420 birds.

Some are particularly distinctive — look out for the world's biggest, and smelliest, flower. Rafflesia Arnoldii. For the less classically educated it is also known as the 'corpse flower' and it gives off a strong scent of rotting flesh, in order to attract insects which transport pollen between the plants. This enormous rust-coloured plant can grow up to a metre wide and its flowers weigh up to 10kg (22lb).

Closer to our home for the week, KK, once known as Jesselton, is the state capital of Sabah, but, in itself, is quite small. It has a population of 400,000 — that's around the size of New Orleans in the US or Nice in France. It's the sixth largest city on the island.

Sabah is known as the 'land below the wind' because it's located below the typhoon belt. This allows for generally perfect weather all year round. It's the second largest of the 13 states of Malaysia.

It wasn't until August 31, 1963 that North Borneo (as it was previously known) became independent of the British Empire. Shortly thereafter (newly named) Sabah, was united with Malaya, Sarawak and Singapore, to form the Federation of Malaysia on September 16, 1963. It wasn't until August 1965 that Singapore was encouraged to leave the federation to do its own thing. Which it did highly successfully.

A charming little-known fact about Sabah is that of the 23 districts within the region, nearly all have at least one special roundabout. Why are they special you ask? Because each roundabout has a statue-like structure depicting a specialty of that district.

Known for its rich marine resources, Kota Kinabalu's eye-catching roundabout includes a massive Marlin splashing from the center of the roadway near the city center. Definitely something to look-out for.

Often, tourist books will pronounce popular 'attractions.' The Yasasan Sabah Tower (aka Menara Tun Mustapha) is one such inclusion. Located about five kilometres from the city centre and standing 30 stories tall, this building has dibs on being the second tallest in Borneo.

But what makes it so unique is that it is actually suspended from a core structure of 96 steel rods. It's one of four such buildings in the world. The 72-sided polygon shaped building has external walls made from over 2,100 reflective glass panels which can withstand wind speeds of up to 272 km per hour. If you want a break from jungle life and batteries, we thought you might find this impressive.

There is a revolving level on the 18th floor, which slowly spins to give a complete view of the Likas Bay. It makes a 360 degree rotation per hour.

Here at *Batteries International* we are delighted at the choice of venue for the 21ABC. There's only one problem as far as we can see.

Research has unequivocally shown that the most successful CEOs are early risers. Some of the world's most influential leaders are morning people, including Tim Cook (Apple CEO), Howard Shultz (former Starbucks CEO), Richard Branson, and Michelle Obama.

If this is you and you're an 'up with the lark' kind of person, you'll probably prefer a sunrise to a sunset, which would be entirely missing the point of Kota Kinabalu.

Because this is a city that faces west in the most spectacular style. The sunsets here are famous and have even made it on to the big screen as film companies flock to Tanjung Aru's Beach 2, a spot renowned for its awe-inspiring views. We would recommend heading there around 6.20pm to soak in what this part of the world can truly offer — a breathtaking end of the day, to yet another successful ABC. ■

In Malay and Indonesian *orang* means 'person' and utan is derived from *hutan*, which means 'forest'. Thus, orangutan literally means 'person of the forest'

Look out for the world's biggest, and smelliest, flower. *Rafflesia Arnoldii.*

The 18th floor of the Yasasan Sabah Tower makes a full rotation once an hour

As The Asian Battery Conference celebrates its coming of age — 21st anniversary — this year, Batteries International spoke to organizer, Mark Stevenson, about the origins and ambitions of this important industry get-together.

Selamat 21!

What do you think is the function of the Asia Battery Conference?
I often don't think of it as a conference; I see it as a gathering of the industry, of people wanting to learn, be educated, and network at a business and social level. For this to happen, you've got to create the right background and atmosphere.

How do you think the conference has changed?
At the very beginning, it was a deeply technical conference. It's still technical, but over the years, it's expanded to be relevant to all people in the industry, from the sales guy to the marketing person.

Also, the industry has changed, and the conference has to reflect that. I've been in this business for over 45 years and have seen many of the battery giants speak about the huge challenges we, as an industry, have faced.

If you look back to the 1970s and 1980s, when we were dealing with issues such as premature capacity loss or the new additives coming to market, a lot needed to be discussed and changed.

The first report on the latest benefits of carbon was at 12ABC in Shanghai.

Nowadays, it's less about those changes and more about modifications to what we do already. For example, new products are emerging, such as EFBs, but they're not on the same scale as PCL. Moreover, we don't have the time or staff that we used to have to throw at the challenges confronting us.

Why is the Asian battery industry so crucial?
Western delegates who have no contact with Asia often don't understand the dynamics of what happens here. Remember, volumes in the Asian lead battery market are 10 times larger than the US and Europe combined. The Western mindset often thinks that Asian markets will follow the same path as theirs, but conditions can be vastly different.

So, for example, why should anyone assume that hybrid cars will be the next step in developing the EV market in Bangladesh? That's not going to happen as it happens in Europe, when the transition will most likely go in a very different way.

Ages ago, I predicted that there wouldn't be very many electric bikes in Vietnam, and I wasn't far wrong. The motorbike was already established in the country, so they weren't going to go backwards to an e-bike.

The lead acid battery market still has a huge growth potential, and it's going to come from Asia.

What do Western battery firms and their suppliers need to do to tap into this huge market?
This question was relevant five to 19 conferences ago. Many companies have a global view and understand the Asian market very well. They realised that to be present in the market, to understand what the market is about, and how competitive it is, you had to be on the ground.

Many companies have done a great job of this, many having their representative offices throughout the region.

I know that you actually start the process of looking for the next ABC as soon as the last one is finished. At what point would you have created the agenda, or thought about market themes and locations?
I don't chase after themes, as they can be limiting. What we do is allow the delegates in the industry to present what they see as important. That means occasionally the agenda will develop its own "theme" as we address the relevant issues of the day.

The ABC has always been renowned for having a very eclectic mix of papers — one moment we may be talking about battery usage in e-Rickshaws, and then the next paper will be about separators. It's lively!

And the choice of KK?
You would be amazed at the number of places that we look at for possible venues. On one level, we're choosing for the size of the conference hall, the availability of hotels nearby, the capabilities of holding the functions — feeding 900 people at once is challenging, especially making sure it's of a high quality — as well as knowing you can trust the service to be delivered.

But on another level, and this isn't so immediately obvious to delegates, Mark [the logician partner/organiser] and I spend weeks seeking the right location to ensure it's a destination in its own right.

Ages ago, I predicted that there wouldn't be very many electric bikes in Vietnam and I was right. The country already had motor bikes, so they weren't going to go backwards to an e-bike.

ABC has always been at the forefront of technology in terms of displays and simultaneous translations. Where do you think it lets you down?

I'm going to have to say PowerPoint! One of the problems with conferences around the world, not just the ABC, is that power point presentations are fairly easy to put together. That creates a less rigorous approach to content — style over substance.

I remember writing up my presentations for the Journal of Power Sources. Some took months to write. They just didn't occur overnight with putting a slick slide deck together. It's the power of sustained and logical thought that creates a great presentation. ■

Visitors from Europe and the US have a long haul to get here. In Europe, within a few hours' radius of a flight, you've probably got 10 to 15 countries and about 30 cities you can visit. In the US, it's similar, if a little farther.

Asia is different in that it's a long way to go, so we want to ensure that it's not just a strong technical conference and an exhibition, but also somewhere interesting for everyone. KK is a great place in East Malaysia. The exhibition centre is magnificent and very new, but it's also a hugely diverse place to be in for a few days.

And the networking events?

The opening drinks will take people The opening drinks will take people down along the waterfront as the sun sets. Everyone should enjoy that.

The gala dinner will hopefully rival Bali, which is probably the best function we've ever hosted. We're still three weeks out from this event and frantically doing the final touches, but it's all coming together.

One of the features of this business is the ability for our people in the industry to become lifelong friends and be able to pick up these friendships just by seeing each other again, even after two or four years.

We may be competitive, but when we get together at the ABC, you can see the camaraderie between us all — it's not just about work, it's talking about everything else as well, which is wonderful to see.

Many years ago, I had a senior industry member with a broad multi-metals experience open the conference. He later told me privately that he's never seen an industry like the lead one, where everyone gets together and becomes almost like a brotherhood. That's a great compliment about a great event. ■

And why the One Minute Giving?

This is very close to mine and Mark's hearts. It's an initiative that has done wonderful things over the past two events and hopefully will again this year. Last time, in Siem Reap, we could actually see the tangible benefits of our giving to that children's hospital, as we also did for the school in Bali.

I feel proud and privileged that the industry is giving something back to the communities where we hold the conference and giving some help to all of those children who are going to the schools.

This year we picked two places. One is an orphanage for children in special circumstances that need to be looked after — often through the loss of parents, but also through court cases and so forth.

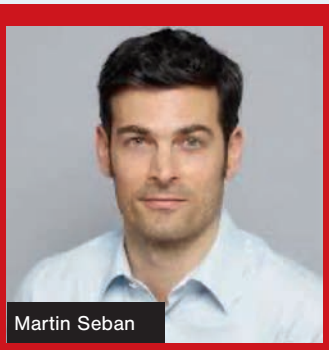
The other we've chosen is an autistic school which gets no support from the government so has to be self-funded and where the parents struggle to pay for their support. ■

"I feel proud and privileged that the industry is giving something back to the communities where we hold the conference and giving some help to all of those children who are going to the schools."

21ABC • SCHEDULE OF EVENTS • Conference Day 1 • Wednesday 3rd September


James Griffiths


Kevin Clarke


Martin Seban


Michael Glenn

Wednesday September 3

9:10 – 9:35
Fight or Flight for Lead in the Battle of the Batteries?
James Griffiths, analyst, CRU

9:35 - 10:00
Tariffs, Technology, Regulation and Subsidies — Determinants of Lead Demand
Kevin Clarke, principal analyst, lead markets, Wood Mackenzie

10:00 - 10:25
A Global Battery Market Outlook to 2030
Martin Seban, senior consultant, KPMG

10:25 - 10:50
Managing Metal Prices in an Uncertain World
Edric Koh, head of corporate client development, APAC, London Metal Exchange

10:50 - 11:10
Morning tea

11:10 - 11:35
From Legacy to New Markets-the Need for Lead Batteries in ESS and Stationary Applications
Matthew Raiford, senior technical director, CBI

11:35 - 12:00
Immediate and Long-Term Prospects and Challenges for Lead
Joao Jorge, director of market research, International Lead and Zinc Study Group

12:00 - 12:25
Evolution: Enabling VRLA AGM Performance with Cost Advantage to a Lead Battery System
Naoto Miyake, Asia technical director, Daramic

12:25 - 12:50
EFB Additive Solution to Extend Cycle Performance
Pengfei Cui, project manager, Shandong Jinkeli Power Sources Technology.

12:50 - 1:40
Lunch

1:40 - 2:05
Innovations in Red Lead-Enhancing Battery Formation Efficiency and Structural Control with Functionalised Oxides
Rainer Bussar, head of R&D, PENOX

2:05 - 2:30
New Generation Lead Acid Batteries-Advancements in Achieving Ultra-Low Internal Resistance in Lead Acid Batteries
Kalyana Sundaram, technical manager, Mark Stevenson, CEO, Eternity Technologies

2:30 - 2:55
Solar Hybrid Case Study and Optimisation
Michael Glenn, principal technical development manager, Battery Energy Power Solutions

2:55 - 3:20
High End Lead Acid Batteries to Support Latest Automotive Power Train (Battery Design and Engineering for Improved Efficiency)
Anjan Roy, Sr. DGM-OEM-R&D (4W), Exide Industries

3:20 - 3:40
Afternoon tea

Supplier showcase

3:40 - 4:00
High Efficient Modular Machine Design for AGM and SLI Battery Production Lines
Michael Wipperfürth, vice president sales, CMWTEC Technologies

4:00 - 4:20
Advanced Methods and Equipment for Modern Battery Manufacturing
John W Wirtz II, president, Wirtz Manufacturing Company

4:20 - 4:40
Beyond the Assembly Line: Automation Technologies Shaping the Future of Lead Battery Manufacturing
Rob Desborough, international sales manager, TBS Engineering

4:40 - 5:00
Enhancing Energy Efficiency and Sustainability in Battery Manufacturing: a Review of ANDRITZ Sovema Equipment
Francesco Capuzzo, Sales & marketing director, ANDRITZ Sovema

5:00 - 5:20
Reinventing the World's Oldest Battery: Nano-Structured Leady Oxides for the Modern Age
Athan Fox, CTO, Regenerate Technology

21ABC • SCHEDULE OF EVENTS • Conference Day 2 • Thursday 4th September


Dong Li


Richard Pekala


Enqin Gao


Donald Karner

Thursday September 4

9:00 - 9:25
Lead-Acid Batteries in Asia
Dong Li, founder, Leoch International

9:25 - 9:50
North American Battery Market Dynamics: Policy Shifts and Market Trends
Roger Miksad, president & executive director, Battery Council International

9:50 - 10:15
The Antimony Price Rise Crisis-a Lower Cost Pathway for Lead-Acid Batteries
Michael McDonagh, CTO, Microtex Energy

10:15 - 10:40
A Comparison of All-Glass and Hybrid AGM
Richard Pekala, CTO, ENTEK

10:40 - 11:00
Morning tea

11:00 - 11:25
The Role of Additives in Auxiliary and Energy Storage Batteries
Francisco Trinidad, consultant

11:25 - 11:50
An Approach to Increase Negative Charge Acceptance and Reduce Water Loss at the Same Time
Enqin Gao, director R&D, Hammond Group

11:50 - 12:15
Changing Market Dynamics of Battery Scrap Recycling in India
Vijay Pareek, executive director, Gravita India

12:15 - 12:40
WaveTech's Innovative CCT and BARS Technologies: a Second Life for Stationary AGM VRLA Batteries With Premature Capacity Loss
Boris Monahov, chief science officer, Dag Valand, CEO, Wavetech Group

12:40 - 1:30
Lunch

1:30 - 1:55
Transforming Lead-Acid Battery Performance: Enabling Short-Time Constant Current Charging via Lead–Carbon Composite Incorporation
Associate professor Shu-Huei Hsieh, VP for R&D, National Formosa University

1:55 - 2:20
Unlocking the Potential of Hydrolysis Lignin for Lead-Acid Battery Performance
Alexander Gonchar, R&D Chief, Synergy Horizon, Achim Lulsdorf, consultant

2:20 - 2:45
Application of Inelastic Neutron Scattering to Understand Lignosulfonate Stability and Lead Battery Failure Mechanisms
Carter Abney, technical application manager, Borregaard

2:45 - 3:10
Prolong Operation Time of VRLA Batteries by Using High Performance Valve Technology
KD Merz, VP technology, Abertax Technologies

3:10 - 3:30
Afternoon tea

3:30 - 3:55
Emerging Trends and Future Prospects for Thin Tubular/Advance/ Smart Lead-Acid Technology
Amlan Kanti Das, SVP, operations and R&D, Luminous Power Technologies

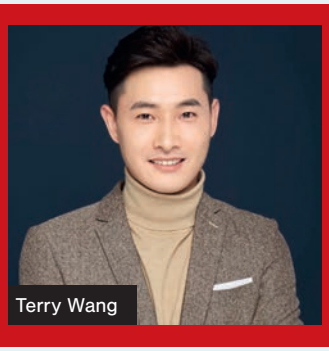
3:55 - 4:20
Monitoring Remote and Mobile Battery Applications Using Cloud-Based Analytics
Donald Karner, president, Frank Fleming, technical consultant, Russell Newnham, technical consultant, Watchdog International

4:20 - 4:45
Effect of Adding Carbon Nanotubes Dispersion in Negative Active Mass on the Performance of Stationary AGM Lead-Acid Batteries
Ivailo Traikov, product specialist, Artmonbat

4:45 - 5:10
The Effect of Carbon Aerogel on Improving the Expander and NAM Performance of Lead-Acid Batteries
Ali Alagheband, technical manager, Sarv Sanat Toos (SST Co.)

5:10 - 5:35
Lead-Acid Batteries in Transition: Navigating Market Dynamics Through Technological Innovation and Strategic Globalization-a Case Study of Alpha Beta AGM Separator Technologies
Xiaofei (Helen) Jiang, marketing director, Alpha Beta Fiberglass Product

6:30-9:30pm: GALA DINNER


Terry Wang


Shouzhong Yi


Shane Christie


Paul Everill

Friday September 5

9:00 - 9:25
Research on the Whole Industrial Chain Operation of Battery Manufacturing in Technology, Industry and Trade Integrated Enterprises
Terry Wang, sales & marketing director, Delp Zheng, director of marketing center, Better Technology Group

9:25 - 9:50
Research Goals: A Look at the New CBI Technical Roadmap and Technical Program
Begüm Bozkaya, senior technical manager, CBI

9:50 - 10:15
Benchmarking Automotive Lead-Acid Battery Technologies — A Comparative Analysis of AGM and EFB Systems with New Data Insights
Martin Wieger, general manager, Austrian Battery Research Laboratory, Micha Kirchgessner, manager R&D Electrochemical Laboratory, PENOX

10:15 - 10:40
Flooded vs AGM Batteries: Understanding the Differences for Micro-Hybrid Applications
Sundar Mayavan, senior principal scientist, Central Electrochemical Research Institute (CSIR)


Sundar Mayavan

10:40 - 11:00
Morning tea

11:00 - 11:25
Discussion on the Characteristics and Potential Applications of Sodium-ion Batteries
Shouzhong Yi, head of product R&D, battery solutions, Wuxi Paragonage Technology

11:25 - 11:50
Optimizing NAM Structure with Additive Formulation for Enhanced Performance in Lead-Acid Batteries for Auxiliary Applications
Sreedhar Naidu Doraswamy-Dy. manager R&D-Materials, AmaraRaja Energy & Mobility

11:50 - 12:15
Impact of Different Laboratory Test Conditions on Float Charging Life at Elevated Temperatures for VRLA Batteries
Henry Zhu, COO, Hoppecke Battery System Wuhan

12:15 - 12:40
Mass Production Applications of Glass Fiber Pasting Paper and Breakthrough Research on Glass Fiber Separators for Sodium-Ion Batteries
Xiaoying Du, general manager, Hua Yang Industry, China


Xiaoying Du

12:40 - 1:30
Lunch

In-depth with the experts

1:30 - 1:55
Resilience Through Innovation: How MOLECULAR REBAR Strengthens Battery Manufacturing in Unstable Markets
Paul Everill, CTO, Nanjan Sugumaran, consultant, Mohamed Sharif, sales director, Pratchaya Senangnart, application development manager, Black Diamond Structures

1:55 - 2:20
Towards Unlocking the Full Potential of AGM-VRLA Battery for Energy Storage Solution
Antara Bhattacharjee, assistant manager reserve power, VRLA R&D II operations, Suspanda Garai, deputy manager, telecom & solar, VRLA R&D II operations, Sagar Sengupta, technology head — VRLA standby II operations, Partha Dasgupta, Sr VP & head of R&D II operations, Exide Industries

2:20 - 2:45
Revolutionizing Lead-Acid Battery Electrodes with Glass Electrode Material (GEM)
Shane Christie, CTO, ArcActive, Kodimole Mahadevappa Mahadevaswamy, senior scientist, battery separator R&D, Hollingsworth & Vose

2:45 - 3:20
Panel Session
Paul Everill, CTO, Black Diamond Structures, Carter Abney, technical application manager, Borregaard, Ali Alagheband, technical manager, Sarv Sanat Toos (SST Co.), Antara Bhattacharjee, assistant manager reserve power, VRLA R&D II Operations, Exide Industries, Shane Christie, CTO, ArcActive

3:20 - 3:30 Conference close

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Giving a hand-up to children in need

The ONE Minute Giveback, a charity initiative that started at the 18ABC in Bali, will be returning to this year's ABC in September in Borneo. It's an initiative that gives the lead battery industry a chance to give back to the children in the local communities where we hold our conferences.

There's always something splendid when an organization — whatever kind, but here a conference — gives back a source of its profits for a good and local cause.

Since 2018 the Asian Battery Conference has led the way for the lead battery industry in showing the way that this can be done.

The ABC has made a concerted effort to give back to the communities where it holds the events something that will last after the conference has gone.

"In 2025 we're focusing our efforts on creating a meaningful impact in the local community of Kota Kinabalu — especially for children in need," says Mark Richardson, one of the event organizers of ABC. " It only takes one minute to show you care, but the difference we make together will last a lifetime.

"With the collective support of our delegates, sponsors, exhibitors, and speakers, we remain committed to making a lasting impact on the communities we visit."

SY's Scott Fink, who has helped as an arranger to the previous ONE Minute Givebacks says: "All proceeds from our ONE Minute Giveback will be used to ensure families living in poverty have access to help for disadvantaged children.

"The power of the industry's giving is multiplied in a developing economy because a dollar goes a lot further than in a rich country.

"It's worth noting too is that ABC has conducted extensive due diligence in vetting the probity and need for help with the chosen charities.

"It's also a thank you to the country that has hosted our conference, a legacy to what we leave behind and a reminder to ourselves that we live privileged lives." ■

ONE MINUTE GIVEBACK

A CSR initiative supported by SY SORFIN YOSHIMURA

Organizer's statement

As part of the 21st Asian Battery Conference (21ABC) in beautiful Borneo, we're proud to continue our tradition of giving back through our ONE Minute Giveback initiative.

This year, we're focusing our efforts on creating a meaningful impact in the local community of Kota Kinabalu — especially for children in need. It only takes one minute to show you care, but the difference we make together will last a lifetime.

Be a part of something bigger. Let's spark positive change, one minute at a time

We would like to see as many delegates involved as possible! Join us and be part of something truly special.

Eye witness: 'the fruits of our giving are real and very tangible'

Batteries International's John Shepherd visited one of the charities supported at the last ABC: the Angkor Hospital for Children. He wrote afterwards about his experience.

"I had the privilege of joining a small group of 20ABC delegates on a visit to the hospital. We had been invited to see at first hand how ACH coped and to understand how precious every dollar of support is in supporting the facility's mission to provide specialist care for children across Cambodia with long term, rare or acute conditions.

"One little girl, no older than three or four, was sitting patiently on a bench outside the oncology unit. I nodded and smiled at the girl, who placed her hand into the reassuring lap of a woman sitting alongside her — most probably 'Mom' — before she beamed a smile back.

"It was a smile that belied the undoubted discomfort — to put it mildly — that the child must have been enduring. Her innocent face was cruelly disfigured in a way that requires no elaboration here

"She clearly deserved the urgent care of the medical professionals. I unashamedly shed a tear (which felt to be a wholly inadequate response) and others in the group were equally struggling to keep their emotions and sympathies in check.

"But for me, the expression of a little girl bravely smiling through everything, despite her condition, encapsulated the welcoming and hopeful spirit of the entire hospital and the good that our money would do." ■

Seri Mengasih Centre

The Seri Mengasih Centre is a charity non-government organisation relying mainly on fundraising projects, and public donations for its operation costs.

It operates as a special developmental day training centre providing specialised training for students with intellectual and developmental disabilities from as young as three years old up to adulthood.

The centre says:

"Every child deserves to have access to education especially children with special needs.

"Unfortunately, some students are unable to continue even the most affordable education programmes due to financial hardship.

"Raising and caring for an autistic child is a full-time commitment and many parents sacrifice their own aspirations in the process.

"We're seeking support to fund educational opportunities for these parents, so they too can grow, learn, and thrive alongside their children."

The school currently has 66 students. The school charges parent a very low placement fee but with many families on income at the poverty level they find it impossible to pay the fee.

Seri Mengasih Centre's primary mission is to enable and empower our students towards a life of hope and dignity within the community.■

The ONE Minute Giveback target

1 US$2,900
One Place at the Seri Mengasih School, full day for a full year.

2 US$1,700
One place at Seri Mengasih School, half day for a full year.

3 US$8,500

The ABC organising team says its target is to have scholarships for two full day and one half day places for a full year along with a small donation to support the centre's operations

The Children's Home in Kota Kinabalu

In March 2025, ABC organisers had the opportunity to visit the Children's Home in Kota Kinabalu.

While the dedicated team at the orphanage does an incredible job caring for the children, it was clear that the facility operates with limited resources. Many of the children lack even the simple comforts and experiences that so many of us take for granted.

"Our ONE Minute Giveback target is to make magic happen by fulfilling the wish list of all the children," says the ABC organizer team. "From toys, laptops, tablets and cool shoes (and maybe a few superhero capes), if we can reach our target, we are sure to bring huge smiles to the kids' faces.

"It's our chance to spread joy, share kindness, and remind these amazing kids that wishes do come true — with a little help from us."

The orphanage provides a safe, loving home to children who are orphaned or come from deeply impoverished backgrounds. While it receives some government assistance, additional funding is essential to provide proper care, education, and brighter futures.

This April the home has 57 children and babies.

13 boys aged between 7 and 18 years old
30 girls aged between 7 and 18 years old
6 toddlers aged between 3 and 6 years old
7 babies: below 3 years old

To ensure all children receive similar devices and items and to ensure all electronic devices are compatible with local electricity Sorfin Yoshimura and 21ABC organisers will procure all Wish List items for the Children. .■

The ONE Minute Giveback target

1 US$3,000
Baby room and toddler room wish list

2 US$5,500
Kids wish list target.

If we can raise enough cash donations our BIG stretch target is to also build a playground at the Orphanage.

THREE WAYS TO GIVE

ONE MINUTE GIVEBACK

1. JOIN AS A PARTNER

Join us as a partner and support our worthy Giveback!

2. DONATE ONLINE

Our online donations are open https://conferenceworks.eventsair.com/recycle-100-21-abc/one/Site/Register

3. DONATE ONSITE

Delegates' partners will be out taking onsite donations with the help of our event team.

Want to get involved? Contact Scott Fink (sfink@sorfin-yoshimura.us) from Sorfin Yoshimura or Mark Richardson (mark@conferenceworks.com.au) from the 21ABC organising team as we would love to hear from You!

Enhancing Lead-Acid Battery Performance:

A New Approach to Increase Negative Charge Acceptance and Reduce Water Loss Simultaneously

In the quest to maximize the performance of lead-acid batteries, particularly in Enhanced Flooded Batteries (EFB), Absorbent Glass Mat (AGM) start-stop systems, deep-cycle, and energy storage applications, a critical challenge has been to enhance the negative plate's charge acceptance while mitigating side reactions such as the hydrogen evolution reaction (HER). Traditional methods, including the use of high-conductivity carbon and increasing carbon loading, have achieved notable success but at the cost of significantly increased water loss.

Causes of Water Loss

Water loss in lead-acid batteries can be attributed to harmful impurities like nickel, copper, and antimony, which can be reduced through the use of low-impurity raw materials and better control of the production process. However, water loss caused by active sites on the surface of carbon remains a challenge. Higher surface area carbons have more active sites that catalyze HER.

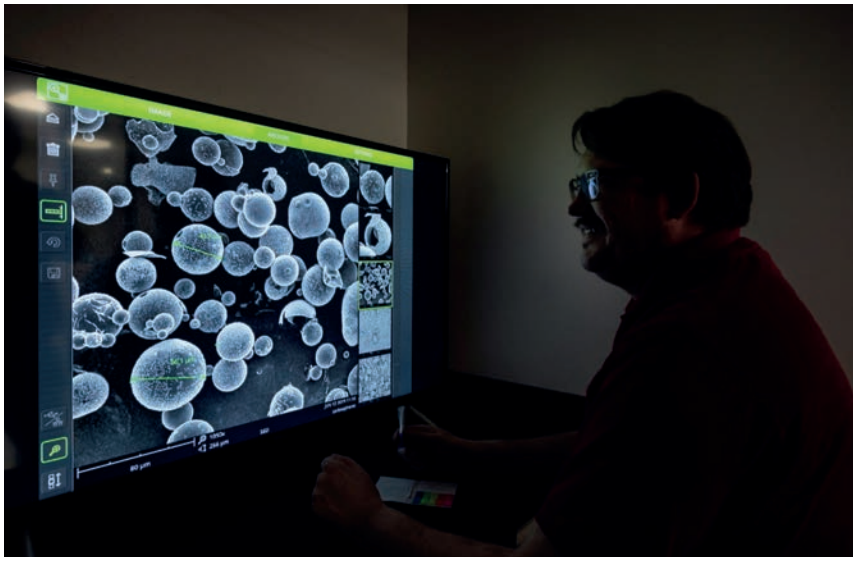
A New Approach

Developed through lab and industry research and testing, Hammond has introduced a composite lignin that selectively covers the active sites of carbon, drastically suppressing HER while providing similar performance to the typical industry-used lignin. This innovation allows Hammond to offer expanders with improved charge acceptance and lower water loss simultaneously.

Test Plan and Methodology

The test plan involved comparing four types of carbon: expanded graphite, multi-purpose carbon black, acetylene black, and furnace black. Two types of lignin were used: Vanisperse A from Borregaard Lignotech and Hammond's Composite Lignin. The total lignin loading was the same for all four EFB expanders.

The cell structure for testing included 3P2N cells, and the test procedures encompassed formation, C20, CCA-1, reserve capacity, CCA-2, gassing, Peukert, and cycling tests at 17.5% and 50% Depth of Discharge (DoD).



Thomas Wojcinski, Senior Research Chemist at Hammond's state-of-the-art R&D facility in the USA, is evaluating detailed SEM images of lignosufonate spheres being used in battery performance testing.

Test Results and Observations

The test results revealed that all cells were formed with the same formation profile. The BET surface area of the negative active material (NAM) increased with the addition of carbon in both cured and formed plates. The capacities of the cells were consistent across different expanders.

In the CCA test, all EFB expanders showed very close CCA 10-second voltage and CCA time to 1 v per cell to the SLI expander. The gassing test indicated that the EFB D expander had the lowest gassing, as evidenced by its more negative potential during the test.

During the 50% DoD cycling test, the EFB expanders demonstrated significantly better cycle life compared to the SLI expander.

In the 17.5% DoD cycling test, Different EFB expanders showed different cycle life which corresponded to different performance requirements. EFB B expander passed 9 units and met the requirement of Level M1; EFB C expander passed 15 units and met the requirement of Level M2, EFB A expander passed 18 units of test and met level M3 requirement. All EFB cells were limited by positives,

with the negatives in good health conditions at the end of discharge. The charge factor remained consistent across all expanders during the 17.5% DoD cycling test.

Conclusions

The study concluded that the addition of carbon material to the negative paste increases the BET surface area of the NAM in both cured and formed plates. There was no significant difference in C20, reserve capacity, and CCA among the four EFB expanders. In the 50% DoD cycling test, all EFB expanders exhibited significantly better cycle life than the SLI expander.

In the 17.5% DoD cycling test, all cells failed due to the positive plates, with EFB A demonstrating the best cycle life. The study suggests that the negative formula can significantly affect the performance of the positive plates in cycle life tests. Hammond's composite lignin (EFB D) in the EFB expander achieved similar capacity, charge acceptance, and CCA performance with very low water loss.

This innovative approach by Hammond represents a significant advancement in the field of lead-acid batteries, offering a promising solution to the longstanding challenge of balancing charge acceptance and water loss.

For more on this topic

Enqin Gao , Hammond's Director of Research & Development, will be providing a detailed presentation of the results found in this article during his 21ABC presentation, "An Approach to Increase Negative Charge Acceptance and Reduce Water Loss at the Same Time," on September 4, 2025 at 11:25 am. ■

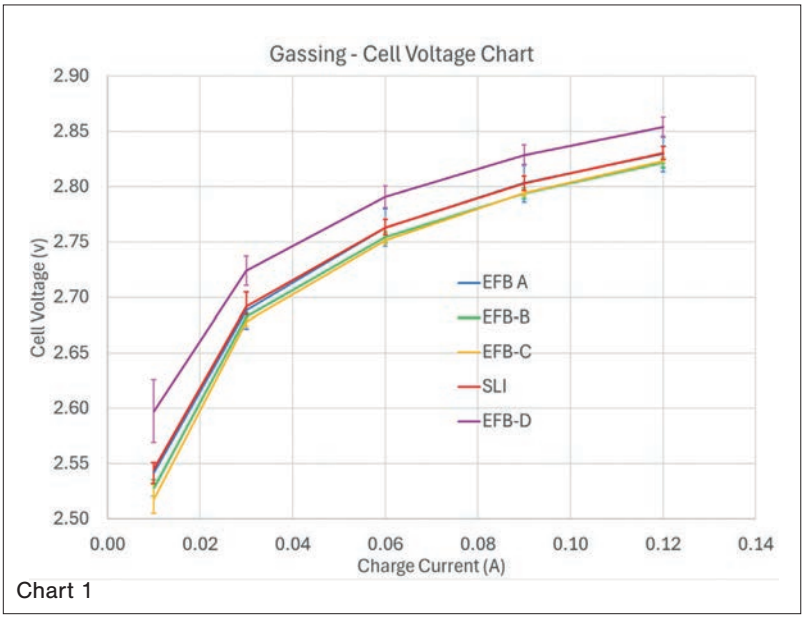


Chart 1

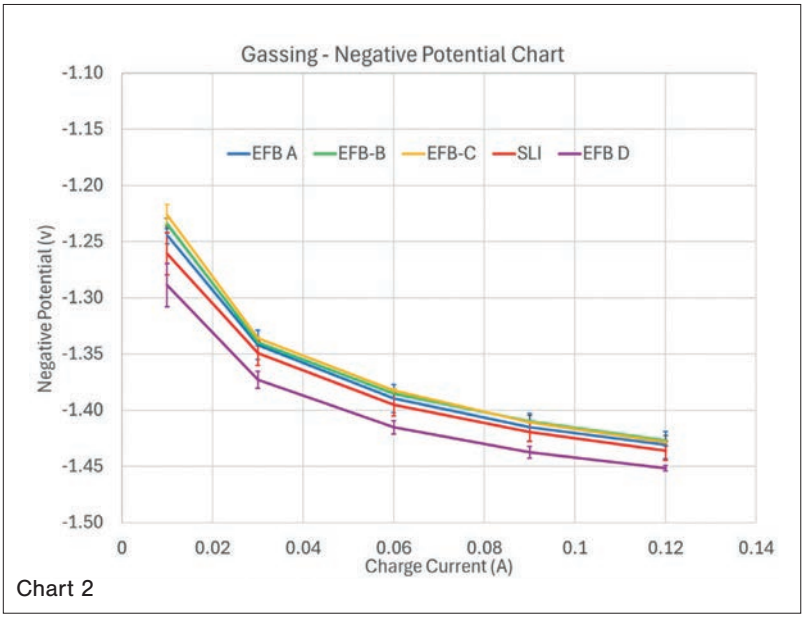


Chart 2

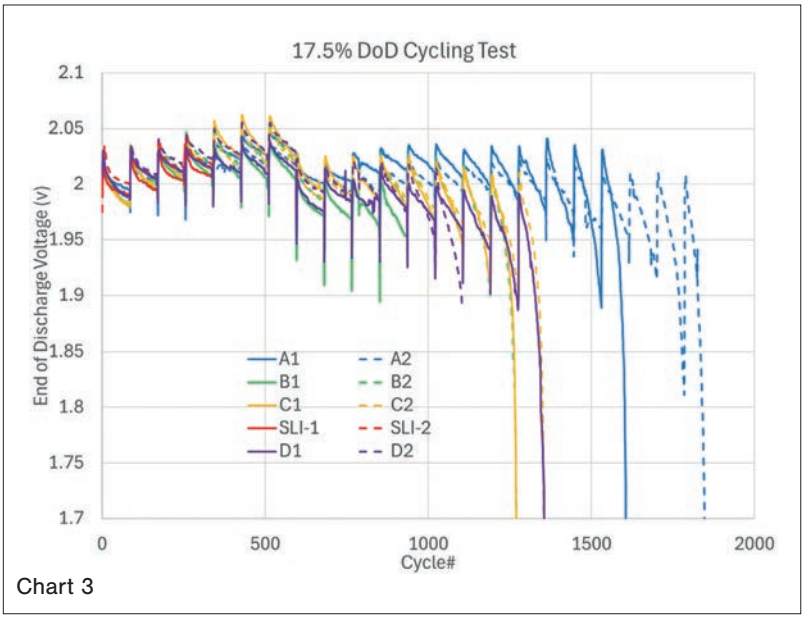


Chart 3

Chart 1: (Gassing-Cell Voltage)

Chart 2: (Gassing-Negative Potential) Cell Test-Gassing: The biggest difference in gassing is in negative potentials. EFB D negative shows more negative potential during the gassing test than others, which means it has the lowest gassing.

Chart 3: Cell Test – 17.5% DoD Cycling Observations: EFB A showed the best 17.5% DoD cycle life (18 & 21 units); EFB C cells passed 15 & 16 units; EFB D cells passed 14 & 16 units; EFB B showed the least 17.5 DoD cycle life (9 & 11 units); and SLI cells had not finished 17.5% cycling test at time of publication.

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ENTEK, the battery separator market leader, has a big presence at this year's Asian Battery Conference.

Crossing the bridge

One of the huge challenges of the battery storage industry in the past 15 years is making the transition from an expertise in manufacturing tailored to the traditional lead battery sector to doing the same in the up-and-coming lithium one too.

ENTEK, which is now the world's largest supplier of lead battery separators, has developed expertise and brought innovation to both lead and lithium battery separator markets.

In the field of lead batteries, ENTEK is recognised as a leading producer of separators for all lead battery applications such as SLI, EFB, VRLA (AGM), motive power, industrial, and stationary batteries

In the field of lithium, ENTEK is able to customize battery separators to accommodate numerous battery designs for electronics, EV's, and aerospace, to accommodate all existing lithium-ion EV battery chemistries, including NMC, NCA, LMFP, and LFP.

In lead technology the firm, which won the 2024 BCI Innovation Award for manufacturing lead battery separators in a unique, environmentally friendly process, says it is exceptionally well placed to service the world's leading battery manufacturers regardless of battery chemistry.

"ENTEK's integrated approach — combining in-region manufacturing, materials R&D, and application engineering — ensures we can support our latest innovations while maintaining the reliability, safety, and cost-efficiency that the world's leading battery manufacturers require," says Clint Beutelschies, VP of global sales.

"The region's rapid production cycles demand equally rapid materials engineering support. By establishing manufacturing and technical service capabilities in every region of the world, we can provide:

* Process control at proximity
* Accelerated validation
* Regulatory adaptation
* Supply chain stability

"In effect, ENTEK's global footprint isn't just a supply position assurance — it's an innovation and performance strategy." ■

"The company has had 40 years of growth, innovation, and success behind us, and I feel like we're just getting started" — Clint Beutelschies VP of global sales

Why ENTEK won last year's BCI Innovation Award

Most flooded lead acid batteries include polyethylene separators. The term "polyethylene separator" is a misnomer because these microporous separators require large amounts of precipitated silica to be sufficiently acid wettable.

The volume fraction of precipitated silica and its distribution in the separator generally controls its electrical properties, while the volume fraction and orientation of polyethylene in the separator generally controls its mechanical properties.

During the manufacture of polyethylene separators, precipitated silica is typically combined with a polyolefin, a process oil, and various minor ingredients to form a separator mixture that is extruded at elevated temperature through a sheet die to form an oil-filled sheet. This sheet is calendered to its desired thickness and profile, and the majority of the process oil is extracted with an organic solvent.

Trichloroethylene, and to a lesser extent hexane, have been the two most common solvents used in separator manufacturing.

In response to environmental pressures

regulatory bodies, the company proactively developed a technology and process to ensure that battery manufacturers will have viable options in the future if regulatory demands require.

This innovation involves the extrusion of isotactic-polypropylene (i-PP) in combination with a nucleating agent, silica, plasticizer, and surfactant to form a non-porous sheet that is wound into rolls. The extruded sheet is then stretched mono-axially or biaxially to form a microporous film as a result of cavitation and/or beta-crystal to alpha-crystal transformation.

Next, ribs are extruded and bonded to the surface of the microporous sheet to form Pb-acid separators in roll form. Battery manufacturers can use this separator product within their existing capital equipment and manufacturing processes (e.g., enveloping). While the product is not commercially produced today, it has been produced on pilot lines and used to produce batteries to validate the performance and process. ■

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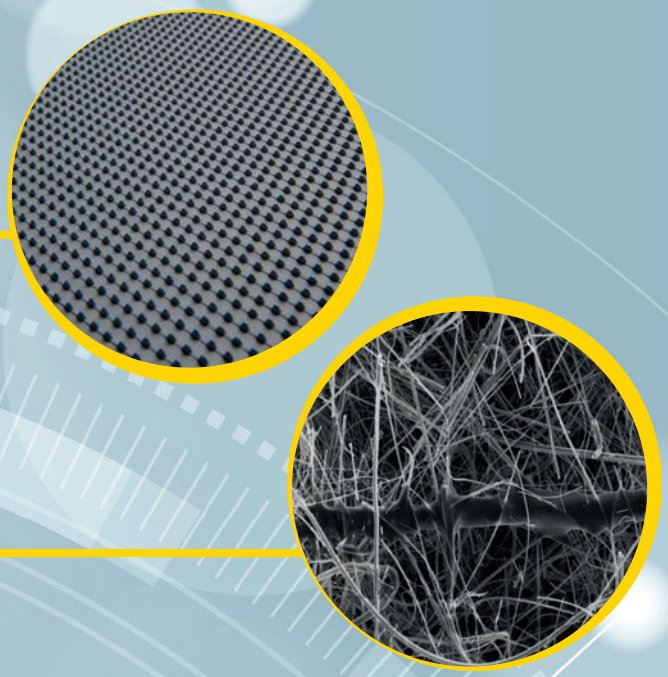

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Making a battery for all seasons

David Rand, one of the early protagonists of ABC, reflects on some of the problems that had to be solved in the development of the modern lead battery.

Gustave Planté's invention of the lead acid battery came at an opportune time as the availability of industrial-scale electricity was accompanied by a rapid expansion in lead acid manufacture.

A decisive step in the commercialization of the lead acid battery was made by Camille Alphonse Faure who, in 1880, coated the lead sheets with a paste of lead oxides, sulfuric acid and water.

On curing the plates at a warm temperature in a humid atmosphere, the paste changed to a mixture of basic lead sulfates which adhered to the lead electrode. During charging the cured paste was converted into electrochemically active material (or the active mass) and thereby gave a substantial increase in capacity compared with the Planté cell.

Soon the idea developed of cutting rectangular holes out of the lead plates to lighten their weight and also to provide receptacles into which the paste could be packed. So was born the modern pasted-plate battery which is by far the most common type of lead acid battery in use today.

The first major market was for stand-by batteries to provide emergency power to essential equipment in electricity-generating stations and at other critical sites. For such large battery applications, it is notable that no other battery chemistry has been able to compete on cost grounds with the lead acid system. Towards the end of the 19th century, electric cars appeared on the roads and were powered mostly by lead acid.

Batteries also began to be used for illumination in railway coaches as well as for powering railway signalling systems, the electrical equipment of ships, and radio receiving-transmitting equipment. With the advent of the internal-combustion engine, the lead acid battery was first employed in road vehicles for lighting, then later also for engine starting, and now additionally for the whole range of electrical duties expected in the modern vehicle.

David Rand: Dealing with PCL problem

The market for off-road traction batteries has also expanded and in almost all cases it is the lead acid system that predominates when the requirement is for stored energy of more than a few hundred watt-hours.

Wood housing

By 1910, the construction of lead acid batteries involved the use of an asphalt-coated and sealed wooden container, wooden separators, thick plates, and inter-cell connections made through the cover by the use of heavy lead posts and links.

The first important change came in the early 1920s when the more acid-resistant, hard rubber case was developed and came into use. During the next 30 years, basic battery construction changed little, although active-material performance was enhanced through the use of additives and through raw material improvements.

Significant advances were also made in grid technology — it's worth noting that in 1881, J Scudamore Sellon had demonstrated the appreciable mechanical and electrochemical benefits to be gained by replacing the pure-lead grids of Faure plates with lead antimony counterparts.

Increases in the efficiency of the manufacturing process were also achieved during this period, especially following the introduction of machine pasting of plates. During the late 1950s, one-piece covers that were epoxy sealed to the cases were introduced. The case and cover material, however, remained hard rubber and inter-cell connections were still made through the cover.

Lower-resistance separators, which were made of phenolicresin-impregnated cellulose fibre, also came into use and obviously raised the electrical performance of cells.

Machine stacking of battery plates became common and thereby reduced the level of manual labour involved in battery manufacture.

In the early 1960s, a method was devised for automatically joining plates of the same polarity within a cell element. Simultaneously, a technique for connecting the cells within a battery in series through the cell walls was developed. This markedly reduced both the internal resistance of the battery and the amount of connecting or 'top' lead needed.

Major advances were also made in plate design and production techniques that gave rise to more efficient batteries with high specific power. In the late 1960s, the injection-moulded polypropylene case and cover were introduced and gave the lead acid battery a durable, thin wall, lightweight container.

Moreover, the thin outside walls and cell partitions permitted the use of more active material without increas-

The market for off-road traction batteries has also expanded and in almost all cases it is the lead acid system that predominates when the requirement is for stored energy of more than a few hundred watt-hours.

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ing the external weight or volume of the battery. Finally, the performance and life of the batteries were both enhanced through the availability of low-resistance, highly durable, plastic separators.

Meanwhile, a technological explosion was waiting in the wings!

Classical lead acid batteries are flooded systems. That is, the electrolyte medium is a free liquid to a level above the top of the plates and above the busbars. This has the disadvantage that the cells have to be vented to release the gases liberated during charging, namely, oxygen at the positive electrode and hydrogen at the negative.

As a consequence, not only is water lost (and thus has to be replaced by regular maintenance operation), but also the battery may be used only in the upright position, otherwise leakage of the sulfuric acid solution takes place.

Also, the released gases carry a very fine mist of sulfuric acid that is highly corrosive. Thus efforts were made to develop sealed batteries that would not require topping up with water and would be safe under all conditions of use and abuse.

Catalytic recombination

At first, such attempts revolved around the catalytic recombination of the gases within the battery, but this idea proved to be impractical.

Success came, however, with the invention of the valve-regulated lead acid (VRLA) battery. The first commercial units were introduced by Sonnenschein in the late 1960s and by Gates Energy Products in the early 1970s.

These were, respectively, the gel and absorptive glass mat (AGM) technologies.

In the VRLA design, oxygen evolved during charging transfers through a gas space to the negative electrode where it is reduced (recombined) back to water.

This process is known as the internal oxygen-recombination cycle. There are two alternative techniques for providing the gas space. One cell design has the electrolyte immobilized as a gel; the other has the electrolyte held within an AGM separator. Gas passes through fissures in the gel, or through channels in the AGM.

A corresponding recombination cycle for hydrogen is not possible because oxidation of the gas at the positive electrode is far too slow. This feature, together with the fact that oxygen recombination is not complete (the efficiency is typically 93% to 99%), requires each cell to be fitted with a one-way valve as a safeguard against excessive pressure build-up — hence, the term valve-regulated.

The VRLA battery can be employed in any orientation, and thus gives equipment design engineers a much greater degree of flexibility. Antimony is not included in the grid alloys of VRLA cells because this element lowers the hydrogen over-potential and therefore encourages gassing at the negative electrode during charging.

Care must be taken against the introduction of other elements that might act similarly. Today, lead calcium tin alloys are preferred by manufacturers of VRLA batteries for float duties, and lead tin for cycling applications.

Initially, there was a vexatious problem to be solved, namely, the propensity of batteries employing non-antimonial grids to suffer a rapid loss of capacity early in the projected life of the cell, particularly under deep-discharge conditions.

It was found that the adverse behaviour, loosely termed the 'antimony-free effect', originated from the positive plate. Given the serious commercial ramifications of the effect, both the lead suppliers and the battery industry soon recognized the need for a consolidated programme, coupled with a forum for the global exchange of ideas on how to eliminate the problem.

This prompted the successive formation of the Asian Battery Conference in 1986 (organized by the Australian lead industry), the European Lead Battery Conference in 1988 (organized by the Lead Development Association, LDA), and the LABAT Conference in 1989 (organized by the Bulgarian Academy of Sciences) — all of which continue to this day.

The knowledge and advice gathered via the scientific and technological network that evolved from the above three conferences proved invaluable to the International Lead-Zinc Research Organization (ILZRO) in establishing the Advanced Lead Acid Battery Consortium — ALABC — in March 1992.

Its prime purpose was to combat the threat from the alternative battery systems that were to be developed under the management of the US Advanced Battery Consortium (USABC) following legislation in California for the implementation of zero-emission vehicles (ZEVs). The battery specifications for such vehicles were set by the USABC and included a target life of 500 cycles under the Simplified Federal Urban Driving Schedule (SFUDS) — a performance that VRLA batteries could not achieve at that time.

Consequently, in 1992, a joint ILZRO LDA meeting was held during the Third European Lead Battery Conference to develop a consolidated strategy in search of a remedy for the antimony-free effect (which had, in fact, first been diagnosed by Jeanne Burbank way back in 1964!

Since it had been found that batteries using lead-antimony alloys with antimony contents < 2 wt.% were also subject to the phenomenon, it was decided to refer to the effect as premature capacity loss (PCL), a term that had been recommended by CSIRO's Tony Hollenkamp in the previous year. The ALABC subsequently formed a PCL Study Group, which first met at the Second LABAT Conference in 1993.

Premature capacity loss

After robust discussion, the competing theories of PCL were defined and grouped under two categories, namely:

- PCL-1, caused by deleterious events at the positive grid | active-material interface;
- PCL-2, caused by gradual inactivation of the active-material itself.

Eventually, a unified explanation of PCL was developed, in which capacity loss falls on a continuous scale. The position where a cell lies on this scale is determined by the rate and location at which the connectivity of the active material (ie the apparent density) declines to the critical value where conductivity is compromised.

The final key to solving the PCL puzzle, therefore, was to squeeze more life into cells via a controlled level of separator compression to minimize positive-plate expansion. Apparatus such as the CSIRO piston cell was developed to determine the optimum conditions for a given type of AGM separator.

The results of the studies, together with other improvements in cell design, enabled VRLA batteries to meet cycle-life targets. Thus, in 1995, Pat Moseley, the manager of the ALABC, was able to state confidently that: "PCL is in retreat." ■

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The Asia Battery Conference has been running for some 40 years. Along the way it has set a template for how a successful meeting of the lead battery community should work.

The way we were ...

Looking back at the presentations and delegates for the first ABC gives a surprising viewpoint on how the industry has changed since 1986.

Since those early days the battery business in Asia has moved on enormously — nowadays around two-thirds of the world's lead batteries are made in the Asian region.

At the time of the first ABC in 1986, the world's lead consumption was 5.5 million tonnes, with 65% of that entering the battery market. Today it consumes more than 14 million tonnes, with 85% being converted into batteries.

It's a far cry from that first conference when the market was dominated by the use of antimonial alloys and when many Asian producers were only starting to think about converting the negative into a calcium alloy and producing their first hybrid battery.

Perhaps the most striking change between then and now was the almost complete lack of involvement with, or by, China.

Although the first attempts at market socialism had already started by China's leader Deng Xiaoping in the early 1980s, the country was a long, long way from becoming the industrial giant of the future.

What is stranger still is the fact that within a few years — 1992 — China initiated a strategic shift towards EV development that has given it a historical head-start over the rest of the world. And a lead that exists to this day.

Founding members of ABC John Manders (left) and Jerry McAuliffe(centre). On the right is David Rand who used to read and edit the technical papers.

So, in the regional presentations — India, Indonesia, Japan, the Philippines and Taiwan were featured — the lack of China to today's viewer looks astonishing.

And out of the 137 delegates just two were from China.

Meanwhile non-China — Taiwan and Hong Kong (1ABC was held 11 years before Hong Kong became part of the People's Republic) accounted for 19 delegates. It's strange to think that today's battery giants from China were not even gleams in their founders' eyes.

Equally interesting in another direction was how prescient some of the thinking was behind the presentations.

Some 30 years before today's excitement about linking renewables from sources such as solar panels to modern electricity grids was being debated — Kaiichi Shimizu from Furukuwa Battery was presenting on Lead Acid Batteries for Photovoltaic Systems and Rainer Kiessling from Hagen Batterie was talking about Lead Acid Batteries for Load Levelling Applications.

And, of course there's so many companies that are now little more than names from the past.

Hagen Batterie being a case in point. Two years after Kiessling gave his presentation, the family firm had become part of Spanish battery firm, Tudor — which again slipped into Exide Technologies' embrace in 1995.

But there are also a few familiar companies and brands among the delegates — Bitrode, for example, then was far from ever becoming part of Sovema (which became most recently part of engineering conglomerate Andritz). There were other familiar names — think Digatron, Sonnenschein, Wirtz, Yuasa as well as the fading network of the once mighty Chloride.

FROM THEN UNTIL NOW

The Asian Battery Conference was the earliest major conference that focused solely on lead batteries in the region it was the forefather, by almost two years, of its European equivalent, the ELBC.

The origins of the ABC started in 1986 through an organization called ZALAS, the Zinc and Lead Asian Services, which was based in Singapore. It was sponsored by the major primary zinc and lead smelting companies of Australia and Pacific Rim countries.

ZALAS's main objective was to promote the use of zinc and lead through technically supporting customers and educating them around the use of the elements. They even started a zinc galvanising conference, which today is still running as the Pacific Galvanizers Conference.

The two key figures in its planning were John Manders and Jerry McAuliffe. Manders, a remarkable scientist — who introduced the idea of using a polyethylene case to protect the battery to Australia — was to become the first winner. ■

And, although the firms had yet to merge Paul Fink from Sorfin was at the conference as was his eventual business partner Takahiro Yoshimura, from Yoshimura Products, (now the firms are best known as SF, Sorfin Yoshimura). Their sons Taro and Scott have taken the business to new heights and geographical reach in the past 20 or so years.

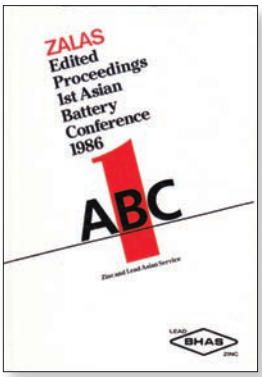
Looking beyond the papers was the social life surrounding the ABC which soon developed into a regular theme of the conference.

"When I took over as chairman more than a quarter of a century ago," recalls Mark Stevenson, it was a very scientific/technical conference. "It was a lot smaller and very much a cosy family affair, in fact at the closing event Colin Woodcock from Britannia would bring a guitar and it would turn into a sing-a-long of the national anthems of the represented countries."

One battery veteran who until he retired had attended virtually every meeting from ABC's inception said: "One of the enduring qualities of the ABC is that there's still a family spirit to the event.

"It's one of the things that came out in the early meetings — and that's despite the fact that the event has grown in size enormously.

"One of the traditions in the early conferences after the closing gala dinner was a sing-song where delegates of each country would stand up and sing a national song. "It was hilarious as well as being warm-spirited," he says, "You would have been amazed at the songs we sang, the barracking, the cheering and fun."



All this is a far cry from the sophistication and global reach of the recent conference series which has become a regional hub for the lead battery business.

But its increasing attendance and popularity spilt over into other areas. "It caught the spirit of the time," industry veteran Ken Peters said much later. "There was a greater willingness to present details of their work and the opportunity for discussing common problems without revealing confidential details.

"Programmes tended to follow industry changes and trends. Delegates welcomed the opportunity to hear about other people's problems and successes and, hopefully, came away with helpful ideas for their work.

"In this respect the concept of ABC and ELBC and the following successful series was new and created a template for industry conferences worldwide."

ABC became an instant must-attend event, ELBC followed in its footsteps.

But these conferences were more than just a template for others. They became a hugely useful networking forum for the entire industry.

Neil Hawkes, lead analyst at CRU, the commodity analysis firm, has attended ABC and ELBC for almost three decades — he went to the first one in 1996 and retired this year.

"I've always enjoyed ABC. It's a friendly conference and very sociable compared with other conferences I attend In the early days, it had a more relaxed atmosphere with fewer people, now I sometimes feel like I'm speed dating with the meetings there!

"The real value for me — as with many others I know — has been securing face-to-face time with the lead producers and a high number of senior executives in such a short space of time." ■

ABC: INTERNATIONAL LEAD AWARD WINNERS

Heroes from the past re-united

The award ceremony and presentation of the International ead medal has always been one of the highlights of the ABC meetings. Because this cannot happen this year, we bring you a roll call of some of the more recent winners...

The International Lead Award was conceived with unanimous support from the lead and lead-acid battery industry in 2002 and presented for the first time in 2003. Its role is to recognise individuals who have made major contributions throughout their working life to the lead or lead-acid battery industries.

The official description used in the selection process describes it as:

"A prestigious award for exceptional service to the lead industry as related to the production, processing or use of the metal in areas such as:

- Promoting increased use or awareness of lead
- Improving lead's image
- Encouraging individuals to excel
- The award should honour and recognize above-average personal achievement."

Different award winners are named each year at either the Asia Battery Conference or the European Lead Battery Conference which both work on a two-year cycle. ■

ABC ROLL OF HONOUR

2003	John Manders
2005	Lan Lam
2007	John Devitt
2009	L Pugazhenthy
2011	Robert Flicker
2013	Brian Wilson
2015	Bob Nelson
2017	Herbert Giess
2019	Frank Fleming
2021	Virtual conference
2023	David Rand

Lan Lam — honoured at 11ABC in Saigon, Vietnam in 2005

The polymath of energy storage

It should probably be called the beer mat that ALMOST made history.

Go back more than two decades and two CSIRO researchers, scribbling on a beer mat, are talking excitedly about a possible new battery. "What if," says one, "we add a supercap to the battery mix?"

"And use that to counter difficulties with operating in partial state of charge conditions?" says the other. "The cycling potential would be awesome."

It's 2003, and sitting just outside the ELBC conference held in Nice that year are David Rand, head of the CSIRO battery research division, and Lan Lam, his chief research scientist.

Both are Australian. Fittingly the beer mat was for Fosters.

The discussion was to have huge consequences for the battery industry and led to the creation of the UltraBattery — perhaps the nearest equivalent to a battery having the capabilities of a lithium ion one but at a fraction of the cost.

Two years later the first patent for the UltraBattery emerged, with David Rand and Lan Lam as co-creators.

Although the UltraBattery never finally hit the production lines of East Penn, which bought the technology later, it eventually — some 15 years later — proved to be a dead end.

But as a problem solving exercise it was characteristic of the research brilliance and ingenuity of thought that characterised the abilities of Lan Lam.

Born in Vietnam, he moved to Japan in 1972 where he obtained his bachelor and masters in engineering at Yokohama National University. He took his doctorate in 1982 at the Tokyo Institute of Technology, Japan.

As a side note it is worth adding that Lan Lam is fluent in five Asian languages.

He subsequently worked at Toshin Industrial, an electroplating company for switches and connectors as a head of R&D before moving to Australia and joining CSIRO (the Commonwealth Scientific and Industrial Research Organisationi) in 1988.

He has been the research leader of many projects (some simultaneously) that have been well sponsored by either domestic or international companies or research organisations.

CSIRO lists some of his accomplishments on its web site.

- Technology for improved battery manufacture (GNB Australia)
- Tin-dioxide coated glass-flakes/spheres for enhanced battery performance (Monsanto Chemical Co, USA and Owens Coming Fiberglas Corporation, USA)
- Minor elements in lead for batteries (Pasminco)
- Orifice pasting of battery plates (Wirtz Manufacturing, USA)
- Fast-charging techniques for electric-vehicle batteries (Advanced Lead-Acid Battery Consortium USA)
- Elucidation of early failure of original equipment automotive batteries (Holden)
- Determination of maximum acceptable levels for impurities in lead used in the production of valve-regulated lead-acid batteries on stand-by duty (ALABC, USA)
- Novel technique (Novel PulseTM device) to ensure battery reliability in 42-V powernets for new-generation automobiles (ALABC, USA)

CSIRO says Lam's research has resulted in a sustained record of major contributions to both the lead and the battery industries that have resulted in the commercialisation of new products and processes. Notable examples being:

- Design of novel plate-processing technology of Exide PowerLift batteries (GNB Australia).
- Development of advanced (bismuth-containing) leady oxide for valve-regulated batteries. This material is now being marketed as VRLA Refined lead by Pasminco, now known as Zinifex. Through Lam's work, it is now generally agreed internationally that bismuth is a beneficial additive.
- Development of two specifications for lead used in batteries. These specifications are now widely accepted by lead and battery industries. CSIRO and the ALABC have been granted a patent for these research works.
- Development of mechanism explaining the premature failure of lead-acid battery under HEV duty and discovery of the battery-life enhancing benefits of fast charging and Novel Pulse device for EV and HEV applications. CSIRO and the ALABC have been granted two full patents for these research works.

Lam was a key scientific adviser to eight Asian countries (China, Indonesia, Japan, Korea, Malaysia, The Philippines, Taiwan, and Thailand) before his retirement some 10 years ago. ■

John Devitt — honoured at 12ABC in Shanghai, China in 2007

True father of the VRLA battery

John's great contribution to the business was as the pioneer of the VRLA battery — a leap forward in technology and performance from the standard flooded battery.

As Ken Peters, the UK polymath and engineer that took the VRLA battery concept to a wider audience of telecoms and other users, later remarked: "John's work in the late 1960s resulted in the largest single boost to total lead sales of any invention in the 20th century."

A pivotal moment in John's life was when local manufacturing giant, Gates Rubber Company, then the largest manufacturer of rubber belts and hoses in the world, decided to go into the battery business,

He joined Gates in January 1965. Three months later John, with his co-developer Don McLelland, submitted a nine-page memo to CEO Charlie Gates called *Lead-Acid Sealed Cells.*

The memo was to make history.

In effect, Devitt's proposal recommended the development of a cell that would perform in a manner similar to that of the sealed nickel-cadmium batteries then being sold.

It was an idea that John later said had been fermenting in his brain since listening to a presentation about nickel-cadmium batteries five years before.

"In 1965 the sealed, spirally-wound nickel cadmium cells operated successfully because they employed oxygen recombination at the negative electrode during the inevitable overcharging which occurs," John later said.

"This feature had been recognized by many lead-acid researchers as a desirable way to improve battery usefulness, but none of them had been able to accomplish it to a useful degree.

"Our main obstacle was the conflict between providing enough reactive acid in the cell while allowing oxygen gas, generated at the positive electrode, to pass directly through a gas space to recombine at the negative surface. Put simply, the separator between the electrodes could not be wet and dry at the same time!

"At first, we had no idea what combination of new ideas would solve this riddle."

So in 1967, Devitt and his 12-strong team, in particular Don McClelland, began work on the research and development of small cylindrical lead/acid cells containing spirally wound electrodes. The first Gates D-Cell was shown to the board on November 10 that year.

Four years later, in mid-1971, the resulting products were offered for sale by Gates Energy Products: one cell equivalent in size to the conventional manganese dioxide D-cell, and another, the X-cell, having twice the capacity.

These cells were the first to use a separator material consisting of microfiber glass paper, now generally termed 'absorbent glass mat' (AGM). This material, the last of scores of tries using diverse separator materials, has the remarkable ability to absorb enough acid to carry out its stoichiometric role in the classic lead-acid reaction equation, yet remain slightly unsaturated to the extent permitting direct passage of oxygen to the damp negative plate surface. (The alkaline electrolyte in a nickel cadmium cell has no quantitative role in reactions within that cell.) Oxygen recombination in a lead-acid cell can go on indefinitely, limited only by heat dissipation and lead corrosion.

"For us, this was the Eureka moment!" John later recalled.

A number of technical developments were later incorporated including substantial compression of the plate-separator assembly.

This greatly lengthened the service life of these first valve-regulated cells. Although the pressure-relief, check valve used in these cells is crucially important, the valve does not regulate the cell.

Ken Peters described its importance: "The development of gas recombining valve-regulated designs has potentially been the most important advance in the development of the lead battery in the last half of the 20th century.

"Offering improved high-rate output, higher specific energy and operating flexibility never previously envisaged, their use in telephone and UPS systems grew quickly replacing previously-used designs in standby applications.

"Within 10 years of the first installation by British Telecom in 1981, 60% of the telephone systems in Western Europe relied upon VRLA batteries for emergency power. Today it must be approaching 100%."

In 1972 Devitt left Gates to go freelance and operated a consulting engineering business which emphasized laboratory development of new products as well as general consulting work in America, Europe and Asia.

Some completed projects include: the first maintenance-free batteries for the General Battery Corporation; lead-chloride plates including initial production machines; making lead acid cells and batteries equivalent to about 100 automotive batteries (all R&D); a low-cost fluoborate battery for automatic fire alarms; an automatic surgical soap dispenser; a battery-testing laboratory; and international assignments including assisting managers in South Korea, Taiwan and much more.

John was the author of four scientific publications and eight patents. The most important is the Devitt-McClelland patent (US 3862 861) of January 1975, which controlled VRLA intellectual property until its expiration in 1992.

John passed away in 2021 in his 96th year. ■

L Pugazhenthy ('Pug') — honoured at 13ABC in Macau, China in 2009

Champion for better recycling

L Pugazhenthy — better known as 'Pug', among his associates and friends in India and overseas — has for the past four decades been at the heart of the lead acid battery community in both his home country and internationally.

The US may boast lead recycling rates in the 95%+ range but in India the rate is close to 100%. The reason is simple. In a country where poverty is rife, every resource of value is cherished. And if it can be used again, it will.

The trouble is that recycling lead is as likely to be done from a crude smelter in the back yard of a small factory or in a garden rather than a installation that could ensure the safety and health of its workers.

The India Lead Zinc Development Association has been at the forefront of a campaign to stamp out these dangerous practices and Pug, as head of the organization, has adopted a two-pronged strategy to do this.

The first was to work with the Ministry of Environment and Forests as well as the regulatory boards in introducing environmental legislations and guidelines for an organized collection of used lead batteries. The second has been working with the industry for eco–friendly recycling of these batteries. Moving the government as well as the industry have proven to be long-term challenges but these initiatives continue to pay dividends; the recycling industry is increasingly improving.

Pug secured a degree with merit in Metallurgical Engineering in 1972. His specialist subject: the extractive metallurgy of non-ferrous metals. He later completed post graduate studies in business management as well as marketing management.

Pug's career started with the India Lead Zinc Information Centre in Delhi as a technical officer, a job he enjoyed tremendously. Between 1986 and 1989, Pug worked in Delhi as the marketing development manager of a zinc-coated steel sheets company called Nippon Denro Ispat — owned by the father of the well known steel giant, L N Mittal).

Pug accepting the International Lead Medal with his wife at 13ABC in Macau from ILA head David Wilson

There was a strong need for a competitive market as wellas technical development in the lead-zinc using industry

He then spent the next three years working for Essar Steel and later on became the director of a newly formed industry body, the Sponge Iron Manufacturers Association in 1992 which he ran successfully until 1997.

But the India Lead Zinc Information Centre was still in his thoughts and when, that year, the chief executive of ILZIC announced he was retiring, he invited Pug to take over.

"With my continuing fascination for lead and zinc as well as non-ferrous metals, I was only too pleased to return to the centre. Since there was a strong need for a cooperative market development as well as technical development in the lead–zinc using industry, I changed its name to the India Lead Zinc Development Association (ILZDA) and re–oriented its activities.

"These were turbulent times. Both the lead and zinc recycling units were in the doldrums," he recalled. "This was largely caused by a supreme court ban on the import of used lead batteries and zinc recyclables. So I met senior government officials and impressed upon them the reduced domestic availability of lead metal and zinc metal, in view of the closure of many recycling units.

"We suggested to the government that they create a technical committee, to give authorization and registration to eco-friendly recycling units for import of lead and zinc recyclables, on a case-by-case basis."

Pug's suggestion was accepted. The technical committee came into existence. The closed recycling units resumed their operations, and the availability of lead and zinc also improved within the country.

ILZDA drafted rules for collection of used lead batteries, on the model of the notification by the International Battery Council as well as other countries. The BATTERY (Management and Handling) RULES came into existence in 2001.

As part of this, auctions of used lead batteries by bulk consumers for railways, defence, transport corporations and the like were also regulated so that these recyclables are processed by authorized/ registered units only.

Pug nowadays is the first to admit that his work is still unfinished given that the Indian lead market is growing so rapidly. "This increases the need for awareness of safe lead usage practices," he says. "We must convert the remaining lead recycling units into healthy and eco-friendly operators. We must continue to educate the lead battery manufacturers, especially the SME sector, on new lead alloys and battery technology developments." ■

Bob Flicker — honoured at 14ABC in Hyderabad, India in 2011

Creative force behind East Penn

Little did a young Bob Flicker realise that a temporary job as a punch press operator at a small to medium sized battery manufacturer in Pennsylvania — known as East Penn — was to result in a spectacular career. Or, later for him to become part of a core team that would catapult the company into the top tier of international battery firms.

The year was 1972. And Bob, recently graduated with a degree in physics from Moravian College, was looking to further his education.

"In those days East Penn had perhaps less than 300 employees but was growing all the time. It had already come a huge way from when DeLight Breidegam Jr and his father had set up the firm in 1946," he later recalled.

"In the midst of this expansion, it wasn't very long before I was working as a lab technician and becoming involved in the firm's development of lead calcium batteries — then the cutting edge of batteries for stationary applications and where the drive was to move it into automotive applications in a sealable form to avoid adding water and improve the safety of the design."

East Penn was developing the engineering department and decided to help fund Bob's tuition. He completed his masters in physics at Lehigh University in 1974.

Bob's experimental and testing work was later to form part of the launch of East Penn's "Kare-Free" line of calcium maintenance-free batteries. The line had so much potential that the company began making plans to build a second automotive plant for its production.

East Penn too was already formulating its environmental position. To handle the wastewater created by battery manufacturing, East Penn also opened a treatment plant in 1977, that would eventually expand to be able to process over 100,000 gallons of wastewater each day.

In line with his ever-growing responsibilities, Bob had to ensure that everything from manufacturing to recycling not just conformed

to stricter regulatory standards but exceeded them. East Penn was one of the few US battery manufacturers that saw early on the way the wind was blowing — regulations were not going to stay still but get ever tighter.

To its environmental credit, in 1986 East Penn introduced a new system for scrubbing gases. It was the first of its kind in the US and six years later also became the first in the entire industry with its acid reclamation plant.

Explosive growth

To gauge the growth of the firm during the 1970s, by 1976 it had around 700 employees. That same year East Penn produced more than a million batteries. It was a far cry from DeLight Sr's ambition to be able to build 100 batteries in a day.

If the 1970s were exciting times for East Penn, the 1980s and 1990s were even more so and Bob's rising star as a capable engineer and manager were on the ascendant too.

From his beginnings as an engineering technician, he was later promoted to product engineer, director of engineering, chief engineer, and vice president of engineering.

In the early 1980s, a new industrial batteries building was opened, along with a new maintenance building, to provide support services to all East Penn units. Later in the decade, a new 135,000-square-foot distribution center and adjacent technical center were opened. New corporate offices were opened in 1985.

Three years later, with the help of a state loan, East Penn opened a new automotive plant more than 100,000 square feet in size. It soon would be expanded to accommodate the production of the new gel cell batteries. In many ways Bob's job brief grew with the firm.

East Penn expanded on a number of fronts in the 1980s. Battery design became the province of CAD (computer aided design), making the drafting tables obsolete. Engineers also turned their attention to new battery technology in the 1980s, such as absorbed glass mat and gelled-electrolyte, non-spillable batteries, ideal for applications such as telecommunications.

"The march of technology is the introduction of change and that means we all had to adapt to them," Bob recalled. "In the 1970s and 1980s a new wave of machines for enveloping, COS, different additives and alloys changed, the way we worked was different — but better."

During the 1980s and into the 1990s Bob's talent for understanding the issues that customers wanted from their batteries and how to solve them started to come to the fore.

By the start of the 1990s East Penn was doing about $200 million in annual sales and each day its 2,000 employees produced about 20,000 car batteries and 1,400 industrial cells. By 1992 the company was producing five million batteries a year. East Penn continued to stay in the forefront of battery technology with Bob now becoming a driving force in the launch of new brands and products,

In 1992 Bob became executive vice president of engineering and manufacturing. Later becoming COO, Bob oversaw not only manufacturing but also purchasing, R&D, logistics, injection molding and a secondary lead smelting operation.

Bob retired in 2022.

"The lead battery world has been blessed with some very knowledgeable engineers. Of those, I have long thought Bob Flicker to be the brightest of them all," said Dan Langdon, former chief executive of East Penn. ■

Brian Wilson — honoured at 15ABC in Singapore in 2013

Advocate for workers' health

Until his retirement two years ago, Brian Wilson had spent two decades at the forefront of international campaigning to make the recycling of lead batteries acceptable from an environmental and humanitarian point of view.

As part of this he has travelled the world on a mission to educate governments, NGOs and individual industry bodies on how recycling lead batteries is not just an issue of public health and environmental responsibility but an economic concern. FOR THE PAST SEVERAL years he has worked with the ILA to help the association conduct environmental audits for prospective members.

Brian's original career took a turn in his 30s when, after spending 15 years in the oil business, he moved to Britannia Refined Metals — part of MIM Holdings, the Australian mining firm which is now a Glencore company. Over the next 18 years his work spanned smelter operations, industrial relations and human resource management.

"My time there gave me a full insight into the issues that the lead industry faces, and the way it tackles them," he recalls. "It was a great preparation for the huge variety of work we do in the International Lead Management Centre."

He was seconded to the ILMC in 1996 from Britannia as program manager, where he remains today, tasked with promoting the sound environmental management of lead.

ILMC is a key programme of the International Lead Association's Lead Action 21 sustainability initiative. Brian's work has taken him around the globe for extended periods, spending months at a time promoting the safe use of lead. Some of this has required intensive work at a local level involving liaison with governments, local communities and NGOs.

"It's difficult to explain how satisfying the work can be — but also how it can also be heart-breaking," he says. "One particular example — but it's just one of many — sticks in my mind. When I was working in Senegal I came across a mother who had lost three children through lead poisoning. She was part of a small lead smelting outfit and she was trying to feed her family and eke a subsistence out of battery recycling. I particularly remember that they were a warm, upright family — but all earning less than a dollar a day.

"It's difficult to explain how satisfying the work can be — but also how it can also be heart-breaking. Following the efforts of the ILMC we can now be thankful that not a single case of lead poisoning like this has happened since our intervention in 2008"

"Although this was just one case of many in the country, following the efforts of the ILMC we can now be thankful that not a single case of lead poisoning like this has happened since our intervention in 2008."

In a world used to talk of leadership from the top, Brian has always adopted a collegiate approach.

"Put simply, we don't enter a country and impose our own ideas of how to remedy any problems they have with lead," Brian says. "Although, of course, we have solutions in mind. Rather we try to get everyone to find, through our guidance, their own answers to dealing with the challenges that face them."

And this has required liaisons at all levels of the industry.

"Brian has developed a huge body of risk management literature, worked with industry, governments and inter-government organizations to set up practical risk management programmes in a wide range of countries," said former ILA head David Wilson, when presenting the award in 2013.

"And overall he has helped create a better image of the lead and lead-acid battery industries by demonstrating that lead can be produced, used and recycled safely and provides enormous benefits to society."

Brian Wilson, an engaging, warm and modest figure, says that part of his enjoyment of his job has been to meet and work with "some of the most remarkable figures in our industry and related to our work.

"I'm delighted to see Brian's tremendous contribution to improving the management of lead recognized by this award," says Andy Bush, head of the ILA. "His passion and dedication to the work of the ILMC is extraordinary and a great example of the lead industry's commitment to taking responsibility for its products throughout the world." ■

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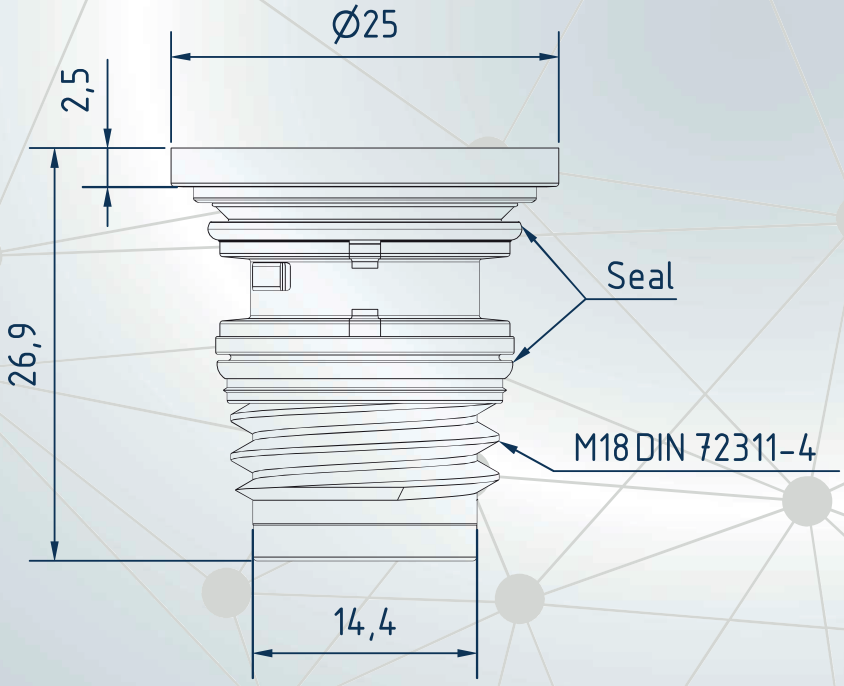

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Bob Nelson — honoured at 16ABC in Bangkok, Thailand in 2015

Bringing the industry together

Bob Nelson, a major figure in the battery industry for the past four decades, is known for his deep technical knowledge and his understanding of the commercial implications of battery technology.

Bob was the leading figure in the early 1990s, with Jerry Cole, in the creation of the Advanced Lead Acid Battery Consortium, better known to the world then as ALABC and now CBI.

Bob and Jerry's mission was to get lead-acid battery manufacturers, their suppliers, smelters, research institutes and others to join together and fund a programme dedicated to exploring the untapped potential of lead as a source of motive power — and give a future to the industry after the first attacks on the technology started.

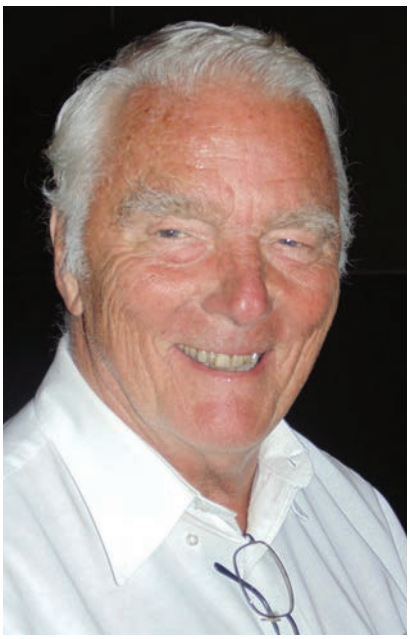
While Jerry tried to tap funding at government level, Bob had the harder task of getting battery makers to agree a common purpose for the industry. And then to fund it.

Over the next three years Bob, Jerry and Dave Prengaman criss-crossed the world trying to put and then keep the consortium together.

They needed a master plan to underpin their goal, which in turn was refined to research in three areas: active materials and cycle life; grids/alloys/top lead and materials; and charging, battery management and electric vehicle battery testing. This approach has broadly remained in place to this day.

Perhaps a key policy decision was that ALABC would be an open consortium with free sharing of research among members, and steps taken to protect proprietary product information.

"The high point of my association with the ALABC was to see different lead-acid companies from different countries sitting around one table joining an international effort to improve lead-acid batteries," Bob says. "In those days most companies jealously guarded their secrets and were loathe to interact with other manufacturers on serious technical matters."



"The high point of my association with the ALABC was to see different lead-acid companies from different countries sitting around one table joining an international effort to improve lead-acid batteries"

Born in 1940, Bob obtained his first degree in Chemistry in 1963 and followed that up with a PhD in Analytical Chemistry/Electrochemistry at the University of Kansas before teaching for 11 years.

Bob's special moment came in 1977, when he was offered a position with Gates Energy Products, a now legendary firm that only a decade or so before had been famous for its tyre and autoparts distribution business.

Gates, largely through the research efforts of VRLA developer John Devitt, who had left the firm, was sitting on a gold mine but didn't know it.

"When I joined they had patents they didn't even understand and were manufacturing the batteries way too early," says Bob.

Bob became a key figure in a turnaround of Gates Energy Products. He looked at improving the manufacturing processes, working first with Hollingsworth & Vose on AGM separators. Gates worked on flat plate design in Denver and then shipped manufacturing to UK firm Varley with disastrous results. Bob was re-assigned to work in London to sort out the problems.

It was a period that, with his wife Elizabeth, he describes as one of the best in his life, both professionally and otherwise.

"It was fun to be the only Yank in a firm of 300 Brits!" he says.

The UK firm was eager to get into flat plate manufacturing as well as work out separator systems using glues and dyes for AGM batteries.

"It was one of the first mature VRLA techniques to emerge," Bob says. "I was particularly proud of the way we started to work with thin plate technology. Gates had the patent for the infamous '861' glass separator more accurately known as patent US 3862, 861 courtesy of John Devitt and Don McClelland. People at the time scorned it, saying the plates would always be more prone to corrode, being thinner. We proved the opposite."

In his late 50s, Bob moved into consultancy work.

"In the past 15 years we've moved away from trying to make better lead-acid batteries using just better materials or improved manufacturing techniques. Now the future is in combining this with accurate and better plate design and processes," he says.

He continues his work for China's Chaowei, one of the largest battery manufacturers in the world.

Perhaps one of the nicest tributes came from John Devitt: "Bob is one of the top electrochemists we have. He is as good as it gets for present-day lead battery consulting. I'm pleased for him that his great contribution to this industry is being recognized." ■

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Herbert Giess — honoured at 17ABC in Kuala Lumpur, Malaysia in 2017

Turning research into substance

July 21, 1969 is etched in the annals of history as the day when man first landed on the moon. It is also the day that Herbert Giess was interviewed successfully for a research post in the Batelle Center in Geneva. The job would set the direction of the then 24-year-old's life and be crucial to the future development of the lead battery.

It was at the Batalle Center the young Giess had his eureka moment. "I finally found my true love, the lead-acid battery!" he recalls.

The early 1970s were exciting times for the industry. In 1971 Delco-Remy, a division of General Motors USA, introduced the first maintenance-free SLI battery, the Delco-Freedom Battery, made with expanded metal lead-calcium grids.

Other lead battery firms were trying to compete with Delco and produce equivalent battery types, but the absence of antimony in the positive grid alloy created massive amounts of early capacity failures.

Battelle Geneva, as a contract research organization, offered its services to solve the problem and gathered, in a multi-year collaborative research project, 12 lead-acid battery manufacturers from Europe, Japan and the US to carry out a fundamental research study — *The Shedding and Aging of the PbO_2 Electrode*.

It was the ALABC before its time.

The Batalle team showed the importance of tin in preventing the passivation of the positive lead alloy grid after a deep discharge. Since then, the presence of at least 0.2% tin in the lead alloy for positive grids has become the rule.

The team pinpointed the so-called antimony-free effect at the heart of many early battery failures and provided recommendations for production changes.

"We identified three modes of negative impact of the absence of antimony on the behaviour of the positive PbO_2 electrode and coined in 1977 the terms Sb-1, Sb-2 and Sb-3 to describe the failures in performance," recalls Herbert.

"These investigations were again picked up anew in the ALABC consortium about 15 years later and the terms 'premature capacity loss PCL 1 and PCL 2' were coined."

"I witnessed the birth of the Absolyte VRLA/AGM cells, and I convinced Accu Oerlikon management that another momentous change in lead-acid battery design was in the making"

His research work brought him in contact with Gould, Inc where he worked on advanced lead-acid batteries for US Navy submarines.

His team was able to develop a highly corrosion-resistant, titanium wire-reinforced large-size positive grid for 5000Ah capacity cells destined for back-up power in nuclear submarines.

"The idea of reinforcing the grid with bare high-purity titanium wires came when, after months of frustrating efforts to incorporate bundles of alumina fibres as reinforcement, and looking out of the lab window to a nearby construction site, it dawned on me that steel-reinforced concrete structures would be a good example for a strong grid," he recalls.

"Titanium is perfectly passivated at the potentials of the positive electrode and thus doesn't corrode when exposed directly to the acid. We needed less than 10% in volume of titanium in the volume of the lead-tin alloy grid to resist creep, corrosion-induced grid growth, as also the forces expected from an enemy depth charge."

Giess later joined Accumulatorenfabrik Oerlikon, one of the oldest lead-acid battery manufacturers in the world, and moved to Zürich, Switzerland.

Accu Oerlikon was renowned for the Oerlikon Battery, with a gelled electrolyte, that had been developed in the 1930s. The gelling was done with a slurry of asbestos fibres and a sodium silicate solution.

This prevented acid spillage when the battery glass jars broke, and the solid gel also averted short circuits between the hanging, separator-less battery plates.

Even a reduced frequency of water additions was claimed as an additional benefit, or a Sonnenschein Dryfit, before its age.

"As head of R&D in Rolling Meadows I witnessed the birth of the Absolyte VRLA/AGM cells, and I convinced Accu Oerlikon management that another momentous change in lead-acid battery design was in the making with the advent of the Gould/GNB Absolyte and the Chloride Powersafe VRLA/AGM stationary batteries," he recalls.

"We then brought on to the market the successful Compact-Power VRLA AGM range, going from 12V-26Ah monoblocs all the way to 2V-3000Ah single cells.

"The ride was not always smooth and we were, as early adopters of this technology, plagued by the VRLA/AGM characteristic negative terminal leakage and strap corrosion.

Herbert then worked in IEC lead-acid battery standardization, becoming chairman of IEC TC21 Secondary Cells and Batteries.

The technical excellence of the VRLA/AGM cells and monoblocs had in the meantime spread to China, and after many technical, organizational and cultural challenges the venture led to a China job, when Accu Oerlikon set up a production line near Hangzhou, the famous Lin'an of Marco Polo.

The latest chapter of Herbert Giess's career began in 2006, when he left Accu Oerlikon to became an independent consultant. ■

Frank Fleming — honoured at 18ABC in Bali, Indonesia in 2019

Pioneer of advanced lead cells

For the past 40 years Frank Fleming has been at the sharp end of the research, manufacture and commercial development of the lead battery business, widely admired for his ability to turn theoretical lab-tested work into practical solutions that can be transferred to the manufacturing line.

Frank's first real battery experience was during a gap year at college when — as was the custom at that time — students took a year's work experience as part of their degree course.

In those days Chloride was one of the three top battery manufacturers in the world, and it was there that Frank came under the influence of Ken Peters — nowadays the man recognized as being the pioneer of VRLA batteries and turning the technology into a commercial phenomenon.

After taking a PhD in solid state proton conduction, Frank returned to work for Chloride, which later became Hawker Batteries, and for the next 19 years the firm was an integral part of his life.

His initial work was as an applied scientist for Chloride Technical, the R&D arm of the group. Oddly, for a man whose career has been almost exclusively spent in the lead industry, for a time he studied secondary lithium batteries with Salford University and the Danish Energy Research Laboratory. This work resulted in the development of a lithium/PEO/V6O13 secondary button cell.

As his experience grew, Frank became a member of a team of on-site troubleshooters, whose role was to resolve local processing problems and to understand the unique electrochemical phenomena that disrupted Chloride's manufacturing.

As well as gaining a thorough knowledge of the design and processing of AGM products it was a tremendous team-building period that finally convinced him that lead-acid battery manufacturing was going to offer him an interesting career and a useful life.

During this time, he spent extended periods working in the South Africa and US manufacturing facilities on the Torque Starter, one of the first AGM batteries.

The early AGM batteries were plagued with problems — it was not just a Chloride difficulty but a worldwide one — which became labelled PCL — premature capacity loss. It was found that cycle life decreased spectacularly in the early months of the batteries' use.

Frank, with what became a legendary group of people including Kathyrn Bullock, Ken Peters, David Rand, Michael Myers, Pat Moseley and Russ Newnham, was one of the team recruited by the then newly formed ALABC to solve the problem.

Around this time, Hawker acquired the Gates Company and Frank became involved in the development and manufacturing of TPPL batteries — a crucial interest in the latter part of his career. Thin plate pure lead batteries offer greater cycle life and deeper power.

Perhaps a key post in his career development was his appointment as technical director for Hawker Energy Products in 1989. Hawker was one wing of Chloride's battery group and an iconic brand. Here his managerial skills were brought out in one of the toughest assignments of his early career—the relocation of an entire manufacturing facility from London to Newport in Wales.

In 2000 Frank left Hawker to become chief technical officer for NorthStar Battery. He was also the firm's co-founder, with three Hawker Battery colleagues, Jerry Hoffman, Joel Gibson and Scott Erwin.

It was clear to Frank and his cofounders that telecommunication standby power was moving away from centralized locations to distributed sites because of the vast coverage requirements of cellular phones. They also realized the technical advantages of thin-plate pure lead technology.

The first batteries found a ready niche with telecoms giant Ericsson. NorthStar went on to become a highly successful manufacturer of advanced lead-acid batteries for telecommunication, UPS and transport applications. In 2019 NorthStar was acquired by EnerSys.

"I'm excited to still be contributing to an innovative industry which continues to push the boundaries of research and development. "

In 2017 Frank became a partner in Electric Applications Inc, working on a US DoE sponsored project between Argonne National Laboratory and a consortium of US lead-acid battery manufacturers. The project — arguably the most exciting for a generation — uses cyclotron technology to look at, real time, the charging and discharging of a lead battery.

Most recently Frank has become a partner in EAI Grid Storage, a new business that advises and designs grid-level battery energy storage systems.

"I'm excited to still be contributing to an innovative industry which continues to push the boundaries of research and development," Frank said when accepting the medal in Bali.

"I think advanced lead batteries are key to the future of battery energy storage and electrification as the demand for safe and reliable battery storage is growing so rapidly. As an industry we must recognize these opportunities and ensure our technology is part of the solution." ■

David Rand — honoured at 20ABC in Siem Reap, Cambodia in 2023

A lifetime's career in batteries

David Rand has been at the heart of the energy storage world for the past 50 years. His academic achievements — he is the co-inventor of the UltraBattery and one of the electrochemists that solved the early 1990s puzzle of PCL — have been matched by a lively presence in the life of the industry.

David was head of the battery research group at CSIRO in Australia and during his time there made it a policy that all avenues of research were valid if battery performance could be enhanced as a result of this. The group expanded its activities to alternative battery chemistries and supercapacitors, together with their integration into hybrid energy storage-delivery systems for stationary, mobile and portable applications.

David became a household name in the lead battery industry as being part of a select group charged with solving the seemingly intractable problem facing manufacturers and users alike of VRLA batteries.

The shorthand for the problem was PCL — premature capacity loss. PCL drastically shortens the life of lead batteries under deep cycling. It was particularly prevalent in batteries with positive plates that were either antimony free and had low-calcium alloys to reduce water loss. Moreover, it was independent of plate design or how the paste was applied.

The problem occurred with flooded batteries and the then new wave of VRLA batteries which had taken the telecoms world by storm in the early 1980s.

David took the chair of the World Study Group into Premature Capacity Loss of Lead Acid Batteries in 1993. This was formalized in an ALABC programme when David took over as temporary head of the consortium in 1994.

David has been a key figure in the technical assessment of papers presented at the major lead battery conferences run in Asia and Europe. — he was there at the first conference in Bangkok in 1987 — as well as its later European counterpart the ELBC.

David retired from full-time work at CSIRO in December 2008 but remained an Honorary Research Fellow until a couple of years ago.

David has also been one of the key figures of the World Solar Challenge — one of the more unusual ways of testing battery development — where a solar-powered vehicle has to cross 3,000km from the north of Australia to the south and use battery storage as an essential part of the journey.

David's research has been recognized both nationally and internationally. These include:

1991:	The Faraday Medal of the Royal Society of Chemistry (UK)
1996:	The UNESCO Gaston Planté Medal
2000:	The CSIRO Chairman's Medal
2003	The Australian Centenary Medal
2006	The R.H. Stokes Medal of the Royal Australian Chemical Institute
2008:	The International Energy Agency Hydrogen Implementing Agreement Angel Award
2008:	The CSIRO Medal for Research Achievement
2013:	Member of the Order of Australia
2023:	The International Lead Medal

David Rand, center, with 20ABC conference chair Mark Stevenson and the executive director of the India Lead Zinc Development Association L Pugazhenth

In 1998, he was elected a Fellow of the Australian Academy of Technological Sciences and Engineering and in 2000, the University of Cambridge awarded him a Doctor of Science (ScD).

Perhaps one of the most fitting tributes to David came many years ago at the Faraday Medal award ceremony. Speaker at the award, Brian McNicol said, that: "Quite apart from his scientific findings that have had such influence, David has over the years been a persuasive advocate of the role of alternative power sources in society. In many respects he has been an inspiration to us all, never fearing to be controversial when the need rose.

"His energetic participation in, and the leadership of, scientific meetings has been greatly appreciated by the electrochemical community." ■

Doing business the Malay way

A few years back, HSBC ran a huge advertising campaign in the UK to promote the fact that they spanned 64 countries and territories around the globe, but that they were still the 'local' bank.

These series of commercials cleverly told the world that HSBC never underestimated the importance of local knowledge and that if you were going to do business internationally, you should be with a bank that had cultural intelligence.

One advert showed how, in some Asian cities, it is acceptable for a commuter to fall asleep on the shoulder of a stranger. In New York, not so much! Another, how the English think it is a slur to not finish what your host has put on your plate, whereas the Chinese feel you are questioning their generosity if you do.

The current King of Malaysia is Sultan Ibrahim Iskandar, who ascended to the throne on January 31, 2024. He is also the Sultan of Johor. Malaysia's unique rotational monarchy system means the throne is held for a five-year term by one of the nine hereditary Malay rulers.

We're a well-travelled lot in the battery industry and think nothing of racking up our air miles to fly to conferences all over the world.

But once we arrive, the reality is that we're often stuck in the homogenous environment of a large Marriott with little opportunity to get out of the aircon and get to grips with the ins and outs of where we are.

Malaysia is a forward-thinking country with vision, a booming economy, a sound infrastructure and business access to over 680 million people in the region. The country uses a catchy slogan to tout its global appeal — 'Malaysia, Truly Asia' — which encapsulates how this southeast Asian nation is a microcosm of the region as a whole. And, obviously, they've got their own way of doing things…

Saving face — upholding one's dignity

All of the ethnic groups in Malaysia understand and practice the concept of 'face'. This encompasses a set of qualities about one's self that need to be upheld at all times – having your own sense of dignity, good name and good character. People will go to great lengths to preserve another person's face. The expression 'to save face' is commonly used.

Indeed, in Malaysia, you must always avoid talking badly of someone in both a public and private arena. Personal esteem and prestige must be upheld. This is especially true in business situations. ■

Bumiputera

The idea of the Bumiputera (meaning sons of the soil in Malay) needs to be understood if you're to do business in Malaysia. This is the name given to the indigenous people of the country who have a special place in society and business.

Policies were brought in during the early 1970s to narrow the inequality between poorer Malays and wealthier ethnic-Chinese. The policy was supposed to end in the 1990s, but it still exists today.

For the Bumiputera there's a generous quota for university places, the right to own a portion of shares in listed companies, cheaper housing and access to government facilities to help start businesses. The Bumiputera's share of the economy has grown 10-fold over the years.

A family affair...

The vast majority of businesses in Malaysia are small to medium enterprises. Many are run along family and ethnic lines, since this is where the base of trust is likely to exist, whereas multinational corporations and overseas offices of international firms are more diverse. Ethnicity is played down and English is the language of business communication. This is in stark contrast to dealings with the government and government agencies, where most are done in Bahasa Malaysia.

Show your respect

Malaysians hold titles in high regard. Among all ethnicities make sure you introduce yourself to older, higher ranking people first and women over men – this etiquette is a mark of respect. If you're at a conference you will find that there are official titles given to people of authority. Here are some examples below:

Tun – the highest honour bestowed by the King, this is limited to 50 living men and women

Tan Sri – the second highest honour bestowed by the King

Datuk or Dato' – the highest title given to rulers

Haji (for men) or Hajjah (female) – the international title held by those who have made the pilgrimage to Makkah. ■

To the outsider, the lead battery business seems to be a tranquil landscape where nothing changes very rapidly. The truth is vastly different. One moment all is calm, the next it has lurched in yet another direction.

Uncertain times make for difficult decisions

2015

• Zesar invests in new factory in Manisa, near Turkey's port city of Izmir. Later expanded to another factory. Plans are to double the firm's manufacturing area to 10,000m^2.

• GS Yuasa acquires Turkish battery firm, boosts stake in Malaysia, expands further in Indonesia.

• C&D Technologies' CEO plans revamp aimed to restore lead battery reputation the firm had in the 1990s and 2000s.

• ALABC restructuring approved by its members and ILA.

• Bipolar batteries make a spectacular return to the limelight with two firms, Advanced Battery Concepts and Gridtential, providing possibly viable alternatives to regular lead batteries.
Both firms will end up winning the BCI innovation award.

• Asahi Kasei acquires Polypore International, the parent company to Daramic and affiliates.

• Death of DeLight Breidegam, charismatic founder of East Penn Manufacturing and creator of the largest family owned battery business in the US.

2016

• BCI launches innovation award. Hammond wins award for further development of its K2 range of expanders and opening up its E=MC^2 laboratory to serve the battery industry.

• Tactical tax reasons are involved in the creation of Johnson Controls International based in Ireland and formed through a merger of Johnson Controls and Tyco International.

• End of a legend. Ann Noll, one of the great institutions of Battery Council International, retires after 37 years with the council. Greatly missed by North American battery firms as well as worldwide.

• Four lead association bodies BCI, ILA, EUROBAT and ABR agree to kickstart a global pro-lead battery campaign. This is the first attempt at full coordination between the organizations.

• Cellusuede moves into new base and 125,000sq ft factory at Rockford in US state of Illinois.

• Ecoult, the East Penn subsidiary, installs UltraBattery in smart grid test bed in Dublin.

• Founder of ALABC Michael Mayer dies.

• A watershed moment for lead battery research when Argonne National Laboratory, RSR Technologies and East Penn Manufacturing agree to work together under a standard US government cooperative research and development agreement.

2017

• ENTEK International, battery separator designer and producer, signs an agreement with Separindo, the Indonesia-based polyethylene battery separator producer and Japanese glass company NSG Group, to make and sell PE separators across Asia. Breaks ground on new plant for this in 2019.

• BCI leads the way with pushing for lower blood lead levels for workers in battery plant.

• Death of Detchko Pavlov, Bulgarian academician and probably the greatest expert on the lead battery that has ever lived. Over his lifetime his research contributed to much of our present understanding of how lead batteries work. He is particularly remembered for the generosity of spirit in sharing this knowledge around the world.

• Doe Run expands lead mining on back of higher lead prices.
• Monbat buys Italian recycling firm Piombifera Italiana.

• Penox opens new product development centre in Germany.

• Chinese e-bike lead battery maker Danneng Power International expands output with $870 million sales.

• BM Rosendahl opens development centre.

• EC fines lead cartel Recyclex, Campine, Ecobat Technologies for fixing lead prices.

• Exide Industries opens $100 million plant in Bengal.

• Belectric, a UK lead acid/lithium battery firm, is bought by German utility Innogy SE (previously RWE).

• Black Diamond Structures opens battery testing for nanomaterials technology facility in Texas.

• Exide Technologies waives the right to use Exide brand name in perpetuity to Indian battery giant Exide Industries. This follows a 20-year dispute over the issue.

• Daramic announces greenfield plant in Gujarat, India finished and operational.

• NorthStar wins BCI award for its remote monitoring technology. This allows battery users to review the battery's health and status at any time from anywhere.

2018

• Batek Makina opens 43,000 sq ft plant in Dilovasi in Turkey.

• Furukuwa Battery partners Vietnam's Pinaco in UltraBattery manufacturing deal. Furukuwa already had operations in China, India, Indonesia and Thailand.

• C&D Technologies, a portfolio company of KPS Capital Partners, acquires Trojan Battery Company.

• Proposal for new body to replace ALABC mooted at Vienna ELBC. The Consortium for Battery Innovation emerged the following year.

• SY Innovations formed, to support SY Group and explore new markets, products and sales/marketing techniques.

• Gridtential wins BCI award for its bipolar battery solution but automation problems on the production line dog adoption despite backing from well-known battery manufacturers.

• Chinese battery firm Leoch makes undisclosed investment in UK firm DBS Energy.

• Hollingsworth & Vose invested in capacity expansion in raw material and global separator production to support the AGM market.

• Duracell unveils new lead battery, citing cost benefits against lithium.

• Solar power company Mobisol partners African lead battery firms for storage component to its offering.

• Canada's Discover Energy buys Korean lead manufacturing business iQ Power Asia.

• India's Exide Industries moves into lithium with Leclanché in joint venture.

• Innovative New Zealand lead battery pioneer ArcActive partners East Penn.

• Amara Raja, Gravita sign recycling deal. JCI, which has worked with Amara Raja for 20 years, formalized an agreement between the two this year.

• Narada inaugurates first of five grid-scale lead carbon ESS in Germany.

• EnerSys buys Canada's Alpha Technologies for $750 million in push into energy storage markets.

• Korean lead battery maker AtlasBX gets go-ahead to build lead battery plant in US.

• Trojan Battery sold to C&D Technologies as last remaining link with Godber family cut.

2019

• RSR Technologies wins BCI award. Working with East Penn Manufacturing and the US Argonne National Laboratory, used Argonne's Advanced Photon Source synchrotron to look at, in real time, the crystallization of lead plates at the atomic level during the charging and discharging process. The results enable the firm to develop Supersoft-Hycycle alloy, which enhances lead battery performance.

• Microporous forms joint partnership with Chinese firm Zisun, the largest fully integrated producer of glass micro-fibres and media in Asia, allowing Microporous to add AGM separators to its product range.

• Specialist battery machine maker Wirtz Manufacturing invests in nickel-zinc battery maker ZAF Energy Systems.

• Johnson Controls Power Solutions — the former battery division of JCI bought by Brookfield Business Partners for $13 billion — launched itself with the name Clarios.

• Lead batteries in India lose subsidies under new FAME-II regulations.

• East Penn takes stake in lithium battery maker Navitas.

• Exide Industries moves into e-rickshaw battery manufacturing.

• Water Gremlin moves back to full production after agency shut-down.

• Upside Group switches on 25MWh lead carbon system in Germany.

• John Devitt, VRLA pioneer and developer dies aged 96.

2020

• Hammond Group completes the first step to employee ownership.

• Covid-19 claims first lead battery insolvency victim, Moll, but outlook for the firm brightens later.

• Exide Technologies (and four subsidiaries) file for Chapter 11 bankruptcy protection to facilitate the sale of its North American assets. In July Exide sells its North American assets to Atlas Holdings.

• German formation firm Inbatec and Kustan become equal and independent subsidiary of new firm RedDotPlastics.

• ArcActive wins BCI innovation award with technology to replace negative battery electrode with non-woven carbon fabric that achieves high DCA with minimal loss.

• Exide Technologies officially separates from its North American business and in October becomes a new European, Asia-Pacific firm. European business, free from the US parent, can focus on its automotive and industrial energy storage technologies. It has two R&D facilities as well as 11 production plants across Europe.

• Don Gribble, inspirational founder of *Batteries International*, passes away in November.

• California DTSC issues writ to former Exide Technologies — now called Stryten Energy — to recover Vernon clean-up costs. Saga continues.

2021

• Batek Makina, the Turkish battery equipment manufacturer, takes over Italian formation firm Bertola and its subsidiary Moran.

• India's second largest lead battery maker Amara Raja announces plans in February to begin working on lithium battery cells.

• Hammond, East Penn, CBI launch joint research program in March. CBI meanwhile announced it had launched a new European research project using neutron diffraction.

• China moves to ban lead batteries in low-speed electric vehicles.

• Chris Pruitt, East Penn CEO takes over as new BCI president.

• Kathryn Bullock, one of the greats in the electrochemical history of the lead battery, passes away in May.

• Hammond Group wins BCI innovation award for development of using lead silicate as a way to counter acid stratification in lead batteries. This is subsequently called GravityGuard.

• Oxis, the lithium sulfur battery developer, is acquired by Johnson Matthey.

• BCI victory as lead batteries removed from California's DTSC danger list. A huge vindication of the value of BCI's tireless campaigning on the subject.

• Lead/lithium hybrid trial starts in Poland in July. GS Yuasa, later, wins another installation of lead/lithium hybrid.
• Clarios pulls $1.7 billion capital raising via an IPO at last minute citing market volatility.

• Ecobat buys German lithium battery recycler Promesa in July in clear sign of future plans. It follows this up in October with acquisition of Emrol.

• ENTEK closes acquisition of NSG separator division in September can offer AGM, P/E and lithium separators.

• Women in The Global Battery Industry group launched at BCI meeting held in San Diego, California.

• Sunlight Systems says it will spend €50 million ($59.2 million) to create the world's largest motive lead battery unit.

• Long Duration Energy Storage Council formed in November by 24 tech companies.

• Monbat plans to open a bipolar lead battery facility by 2024. In following June agreement reached with ABC when Monbat managers secure near 21% stake in the group.

• Stryten buys vehicle power division of Galvion a military equipment maker. In December it buys Tulip Richardson Manufacturing which makes injection moulding products and in January acquires Storion Energy, a vanadium flow battery technology firm.

2022

• Disturbing signs of imminent lithium battery shortages, well before the Russian invasion of Ukraine and the ensuing chaos.

• Shake up of maritime transportation rules becomes likely after cargo vessel Felicity Ace sinks off Azores with talk of lithium fire in EVs being transported.

• Shareholder reveals in February ahead of Metair's results announcement that the South Africa holding group is to sell off its batteries business.

• Surprises at Ecobat as Marcus Randolph is appointed in March as its president and CEO taking over from incumbent Jimmy Herring.

• Clarios acquires Spanish recycler Metalúrgica de Medina.

• India's Exide Industries announces plan in March to invest $800 million in lithium manufacturing.

• Gridtential signs development agreement with Camel Energy.

• Ahlstrom-Munksjö launches AGM line in June in Italy. European battery production is still a mainstream market.

• EU warns in June 'hazard' classification could endanger battery investments/

• Campine acquires Recyclex in €3.5 million agreement in July after court process in May.

• Mark Stevenson wins International Lead Medal at ELBC Lyon and becomes 29th member of Alpha/Beta club. Eckhard Karden also wins ILM.

• Senior management buy-out of Monbat, now one of the five largest battery manufacturers in Europe.

• Advanced Battery Concepts wins BCI innovation award.

• Gridtential announces plans to develop bipolar pilot line with Hammond and Wirtz.

• Ace Green Recycling announces plans to produce US lead in 2023. Later delays ensue.

• Clean-up envisaged for Exide's former plant at Vernon, California which enters 'next phase'.

• Industry first as batteries insurance warranty scheme launched.

2023

• UK and US legislators consider further laws to tighten up lithium safety.

• ABC agrees bipolar lead BESS projects deal.

• Prices and supply chain disruptions hit all battery supplier firms.

• International Energy Agency warns further hikes in all battery packs.

• New direction for lead with battolyser project launched.

• Clarios challenges Mexico claims on soil contamination.

• Lithium fire on container ship blamed on battery from hold EV cargo. Second such fire recorded.

• Gopher Resource wins BCI innovation award with better slag processing.
• Battery 'rogue genius' William Brecht dies at his home in Rio Rancho, New Mexico.

• Leoch's battery assembly plant in Monterrey, Mexico to be operational by end of year says chairman Dong Li.

• Battery and auto components group Metair Investments, 100% owner of Mutlu Aku, First National Battery and Rombat, appoints Johan Mouton as COO.

• KORE Power will use lithium separators manufactured at ENTEK's new plant under construction in Indiana.

• Amara Raja Batteries changes its name to Amara Raja Energy & Mobility showing new avenues of business.

• The US Occupational Safety and Health Administration (OSHA) cites US Battery Manufacturing for four unsafe lead violations.

• The Alpha-Beta Society appoints battery veteran Manfred Gelbke as its 30th member.

• Clarios wins the circular economy category of the World Sustainability Awards.

• Ecobat sells its Zimco Group businesses in South Africa including lead manufacturing, recycling and chemicals firms to AutoX.

• Sunlight Group to spin off lead recycling into a new subsidiary to guarantee raw material supplies.

• Decision on controversial proposals for lead metal to be added to an expanded European chemicals authorization register is shelved until late 2024. Later until 2025.

• EU competition chiefs accuse Clarios, Exide Technologies, Banner, Rombat, Fiamm Energy Technology and its predecessor Elettra of possible collusion to fix starter battery prices, aided by trade association EUROBAT.

• Lead battery developers are urged to apply for US federal funding worth up to $3.5 billion after energy chiefs clarify their eligibility for the cash.

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2024

• Lee Koenig, the driving force in creating the modern Crown Battery, dies aged 94.

• Lead recycler Ecobat commissions its first lithium recycling plant in the US.

• Monbat says it is mulling plans to sell off three subsidiaries including EAS Batteries — for which a planned deal fell through last year.

• Ecobat appoints Thomas Slabe as the company's third CEO and president in five years.

• CBI joins three-year US program for deployment of advanced lead batteries.

• The Sunlight Group signs agreement to acquire the remaining 50% stake in its German lead battery recycling subsidiary Ubatt.

• Private equity firm Trent Capital Partners acquires full control of separator company Microporous.

• EnerSys chooses South Carolina as site to build its planned $500 million lithium ion gigafactory.

• Industry leaders say new lower workplace limits for lead set to become EU law will create unnecessary compliance costs for battery manufacturers.

• European lead acid battery manufacturer Exide Technologies acquires German lithium battery tech firm BE-Power.

• Sergio Pezzotti, founder of battery components group Accumalux, dies in Monza, Italy on March 19 aged 91.

• Largo and Stryten Energy plan a 50-50 joint venture to be a key player in the vanadium supply chain for North American flow battery market.

• US treasury secretary Janet Yellen warns cheap exports from China of products including batteries are damaging national economies.

• South Korean car firm, Hyundai Motor and subsidiary Kia agree strategic cooperation with India's Exide Energy.

• Leoch International reveals plans to build two additional lead battery manufacturing plants (Malaysia, Mexico), as well as expanding lithium capacity in China and Vietnam.

• US Department of Energy awards $5 million each to Battery Council International, New Lab and Clean Tech Strategies to investigate long duration energy storage. Roger Miksad, president of BCI says: "This will bring together BCI, CBI and three national laboratories to conduct pre-competitive research aimed at improving lead battery performance."

• US Department of Energy Better Plants Program awards EnerSys, for the implementation of the Sovema Cold Cube cutting system.

• The most eagerly awaited party of the decade — the special centenary BCI conference celebration — kicks off in Fort Lauderdale, Florida.

ENTEK wins BCI battery innovation award for its solvent-free separator technology. Trojan Battery Company wins Amplify marketing award with its "Say Yes to Trojan AES!" campaign.

• Clarios partners in JDA Swedish sodium ion cathode material and cell technology developer Altris to develop batteries for the automotive industry.

• US president Biden, accelerates trade dispute with China on May 14 calls for tariff hike.

• Europe cannot keep up with the money being thrown at the electric vehicle and energy storage industries through US Inflation Reduction Act.

• The European Commission re-enters China EU tariff war and penalizes 'battery electric vehicles that benefit from unfair subsidization.'

• Stanley Whittingham, joint Nobel Prize winner for inventor of the lithium battery, awarded a knighthood.

• Paul Rüetschi, legendary battery exponent from the 1960s to 1990s, dies a year short of his 100th birthday.

• US Department of Energy issues conditional loan of up to $1.2 billion to ENTEK, to finance making lithium-ion battery separators.

• EnerSys acquires Bren-Tronics, a manufacturer of portable power products including small and large format lithium batteries.

• China formally calls on the WTOto intervene in an EV subsidies row with the European Commission.

• Recycling of LFP batteries will continue to remain unprofitable says Northvolt chief.

• The Alpha-Beta Society names Frank Fleming as its 31st member.

• Howard Myers' Quexco business is to acquire Turkey's Mutlu Akü lead battery business from Metair Investments in a $110 million deal.

• 1937 – 2024: Richard Ross former president of Charles Ross & Son Co passes away.

• 1940-2024 Ex-Daramic head Frank Nasisi passes away.

• Northvolt AB and some subsidiaries in the US file Chapter 11 bankruptcy protection in the US.

• ENTEK gets $1.2 billion US government loan from the Department of Energy for construction of an EV separator plant.

2025

• Incoming president Donald Trump unveils start of a long tariff war.

• Antimony price soars to $40,000 tonne with no near-term respite in sight

• Leoch International reveals a proposal to spin off its Leoch Energy Inc subsidiary and list in the US.

• Eternity Technologies acquires EnerSys plant in India.

• 1933-2025 Norman Bagshaw one of the leading lights in the battery industry in the 1980s and 1990s passes away.

• PNNL wins BCI battery innovation award for its grid energy lab. East Penn wins marketing award with Mission Possible as does Stryten with its GrimReaper campaign.

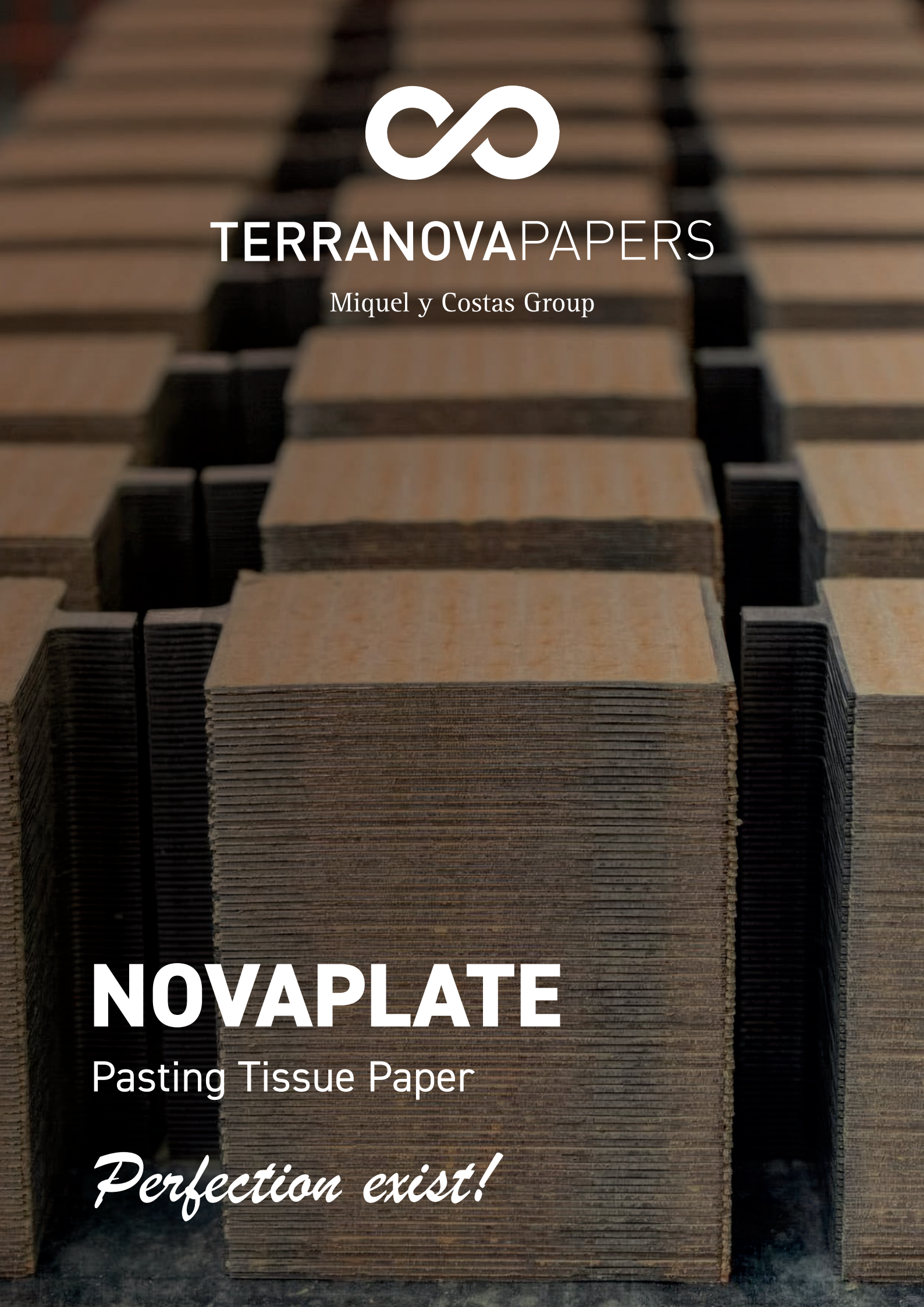
• EU leaders urged to 'stop sending signals' that lead will be banned, which disincentivizes investment.

• EnerSys to close Mexico plant, boost US, Europe investment in lead.

• Energy storage firm XL Batteries has commissioned a pilot commercial organic flow battery project in Texas.

• The Alpha-Beta Society names Juergen Garche as its 32nd member.

• A much loved and admired Roger Winslow, a stalwart BCI supporters passes away. Within a matter of days so does Imre Gyuk, chief scientist for energy storate at the US DoE. ■



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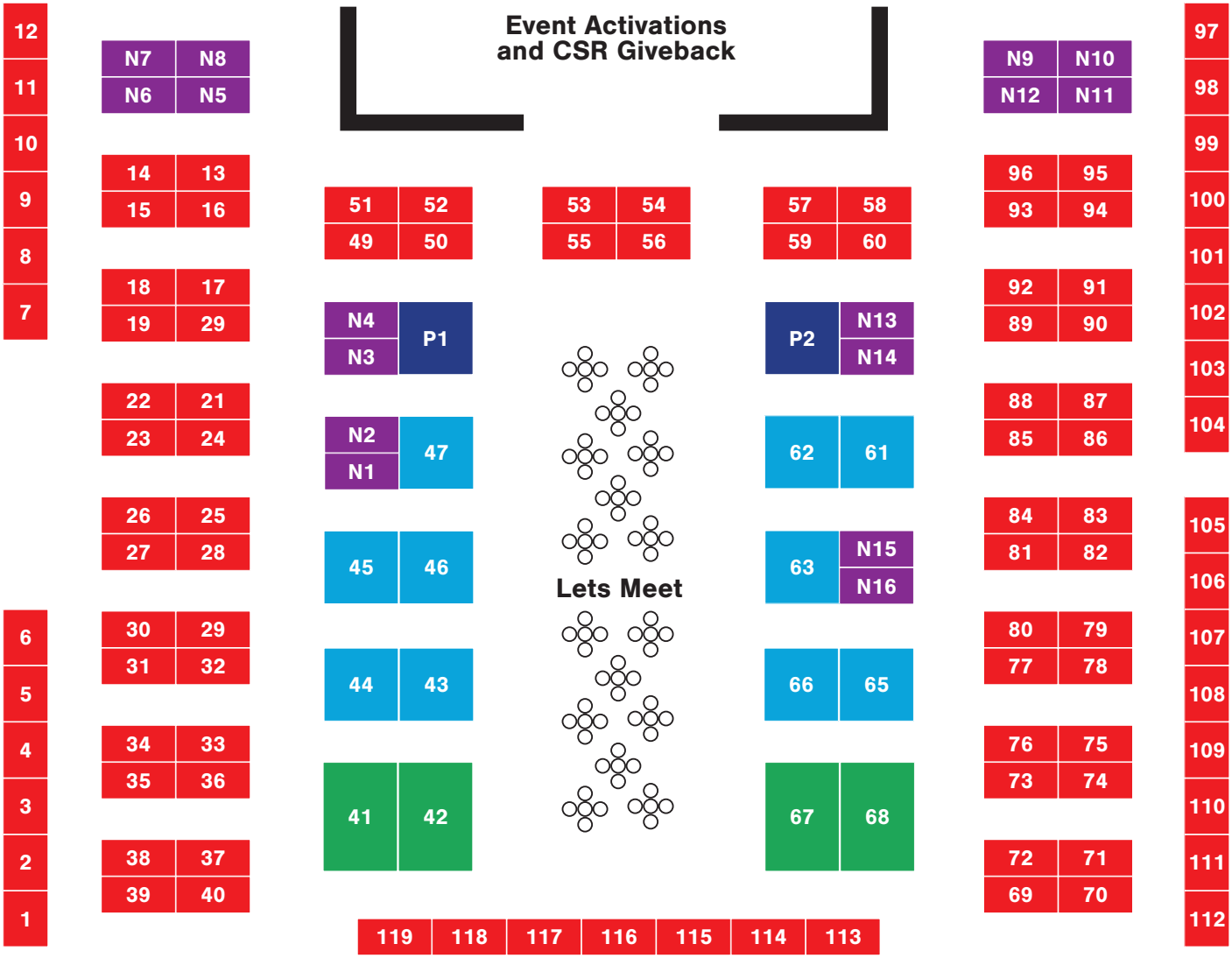
AADISHAKTI	66
ABERTAX TECHNOLOGIES	32
ACCUMA	19
ACCUMALUX	96
ACS LEAD TECH	06
ADOR DIGATRON	45
ALPHA BETA FIBERGLASS PRODUCT	116
AMER-SIL SA	93
ANDRITZ SOVEMA	43
ARDEE INDUSTRIES	62
ASSOCIATED ELECTROCHEMICALS	41
B&F TECHNOLOGY	49
BAODING FENGFAN RISING BATTERY SEPARATOR	24
BAODING GOLDEN SUNLIGHT POWER EQUIPMENT TECHNOLOGY	59
BATEK	71
BATTERIES INTERNATIONAL	11
BATTERY GLOBAL	102
BATTERY TECHNOLOGY SOURCE	84
BERNARD DUMAS	114
BEST MAGAZINE	98
BETTER (XIAMEN) POWER TECHNOLOGY	67
BM-ROSENDAHL	20
BOOYEOUNG ENGINEERING	117
BORREGAARD	100
CHANGXING JINRUN DAZHENG MACHINERY	27
CHINA SANHUAN LIMITED	28
CHONGQING PAPER MAKING RESEARCH & DESIGN INSTITUTE	3
CMWTEC TECHNOLOGIE	31
CONSORTIUM FOR BATTERY INNOVATION	N5
CSSC HENGYUAN TECHNOLOGY	39
DARAMIC	68
DEGANI ALDO	111-112
DESIGN INDIA	9
DITEC ENGINEERING	111 & 112
DSC GROUP	N15 & N16
DUBATT BATTERY RECYCLING	N3
EAGLE OXIDE SERVICES	54
EBC KOREA	118
ENGITEC TECHNOLOGIES	51
ENTEK	42
EROS ENVIROTECH PRIVATE LIMITED	N6
ESWARI GLOBAL METAL INDUSTRIES	P1
FRIMAX	104
FROETEK PLASTIC TECHNOLOGY (WUXI)	87
FUJIAN HUAKE MOULD TECHNOLOGY	30
GALAXY PIGMENTS PRIVATE LIMITED (GPPL)	40
GANG LIH INDUSTRIAL	21
GME RECYCLING	77
GRAVITA INDIA	P2
GUANGZHOU TONGSHANGDE INTELLIGENT EQUIPMEMT	17
HAMMOND GROUP	N1
HEILONGJIANG JINHAN TECHNOLOGY	04
HOLLINGSWORTH & VOSE	82
HUAYANG AGM SEPARATOR	60
HUBEI LHAM ENERGY TECH	92
HUNAN JIANGYE ELECTROMECHANICAL SCIENCE AND TECHNOLOGY	08
INTERCONTINENTAL MEDIA	N11
INTERNATIONAL LEAD ASSOCIATION	N5
IRUNIVERSE	14



exhibitors list

Jun Furukawa of Japan, holder of some 150 patents for alkaline and lead-acid batteries is one of the key international researchers into energy storage. He was awarded the Gaston Planté Medal of the Bulgarian Academy of Sciences in 2017 and was inducted into the Alpha/Beta society in 2018.

Jun Furukawa — Japan's R&D king

It was an unusual background for an unusually gifted man. Jun Furukawa, Japan's battery research giant, was born in 1957 and unusually for the country at the time, into an international context. His father, Kiyoji Furukawa, worked for a US bank in Yokohama, while his mother Chieko and two aunts were fervent Catholics.

After graduation in 1980 Jun took a job in the R&D department of the Furukawa Battery Co — a coincidence of fate since Jun Furukawa is entirely unrelated to the family that ran the company.

His first task was the research and development of lead-acid batteries for electric buses. Years ahead of the curve. The following year, he researched a method of manufacturing a Pb-Ca-Sn alloy strip for lead-acid batteries through continuous cast rolling, its aging characteristics, and its application to batteries.

But early on in his career it was clear that his research would be played out on a larger more international stage. In April 1983, Jun was assigned to the Space Technology Department, where he was involved in the fabrication of a flight model in the development of the space Ni-Cd battery (commissioned by the National Space Development Agency of Japan) and in its qualification tests at NASDA's Tsukuba Space Center. The developed batteries were loaded on satellites such as the MOS-1 and the ETS-5.

Just over a year later, he worked on the R&D of a ceramic seal terminal by the Active Metal method (Ti-Ni alloy) for space alkaline batteries such as Ni-Cd and Ni-H2 (commissioned by NASDA). This was a joint development with Toshiba's Metallic Material Division and, afterward, put into practical use by Toshiba.

The next challenge was to occupy three years of his investigative mind: the development of the space high-capacity Ni-Cd battery (commissioned by NASDA) and the research and performance improvement of a Ni slurry sintered plaque for Ni-Cd batteries, as well as the development of manufacturing processes and

equipment. "Our achievements were applied to consumer batteries and are still used," he later recalled.

From April 1988 to March 1993, Furukawa, now based at his company's R&D centre in Iwaki city, led a Ni-MH Battery Development Group. Having innovated a misch metal-Ni hydrogen storage battery, with its negative electrode being a modification of spherical nickel hydroxide, a positive electrode, and a separator, the Japanese team developed sealed Ni-MH batteries integrating these components and processes for manufacturing electrodes and batteries.

From April 1993 to March 1999, Jun stayed with nickel metal hydride. These were frustrating years as solid improvements were made during a deteriorating commercial environment.

"As a development director for performance improvement of Ni-MH batteries, I'd successfully achieved, for example, an increase in the capacity of double A-sized batteries by about 30% from 1100mAh to 1400mAh.

. As it turns out, I was both creator of our Ni-MH batteries and also witness to the demise of our Ni-MH battery business. We managed to overcome this difficulty but it took years to recover from this."

With the growth in demand for Li-ion batteries, all battery manufacturers except Sanyo and Matsushita were forced to withdraw from their Ni-MH battery businesses.

At this point, arguably, some of his most important research work was to happen by his switch away from Ni-MH. "While most of researchers and developers who had been engaged in their Ni-MH battery businesses moved into the research and development of Li-ion batteries, I was charged with the research and development of lead-acid batteries, which were at the opposite extreme of state-of-the-art Li-ion batteries, though one of our key businesses, where I had a chance to encounter the UltraBattery."

The next few years, until 2006 saw the Japanese battery innovator turn his mind to the challenge of the day: VRLA

Jun was assigned to Technology Development Department and appointed the leader of MV Team and Iwaki Development Centre's Second Group. The challenge was the improvement of 36V valve-regulated lead-acid batteries for next-generation 42V-system automobiles, which meant examining positive and negative electrodes, battery structure, evaluation test methods, and heat dissipation mechanisms.

Next in this glittering chain of research achievements, Jun concentrated on strengthening mechanisms for Pb-Ca-Sn-Ba alloy (collaborating with the Iwaki Meisei University) as well as a method of suppressing sulfation of lead-acid batteries and BCM, a lead-acid battery and super capacitor module.

What put Jun firmly on the international map was his collaboration with CSIRO — Australia's national science agency (Commonwealth Scientific and Industrial Research Organisation) — on the development of the UltraBattery.

This was a revolutionary technology invented by Lan Lam from CSIRO, where a ultracapacitor is incorporated in a negative electrode of a lead-acid battery to achieve higher operational durability under the PSOC conditions.

Although the UltranBattery — possibly the most celebrated of lead battery achievements — eventually never reached mass production by East Penn that acquired the technology, it was feted for almost 15 years as the possible next step for the lead battery industry. ■

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