PALO ALTO | 29 MAY 2025

WEAUTOMOTIVE GROUP

xEV / HEV BATTERY THERMAL MANAGEMENT

INNOVATION SUMMIT USA

USA'S LONGEST RUNNING AND LEADING TECHNICAL CONFERENCE & EXHIBITION FOR EV BATTERY THERMAL ENGINEERS

CURATED IN PARTNERSHIP WITH THE OEMS, THIS YEAR'S AGENDA ADDRESSES THE MOST PERTINENT CRITICAL INDUSTRY CHALLENGES AND KEY INVESTMENT AREAS

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CONFERENCE & EXPO

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CUTTING-EDGE INSIGHT DELIVERED BY EXPERTS AND THOUGHT LEADERS

Our programs are diligently researched and curated in partnership with Battery Thermal Management community, to **ensure they address the most pertinent current challenges and key investment areas.** This level of detail is part of our pioneering approach to content and ensures that we attract the highest level of attendees.

Bob Galyen
Conference Chair: Retired Chief Technical Officer **I CATL**

Arnaud Gug
Director of Product Management
I EJOT ATF

Mekiyah Bailey
Field Application Engineer II
I Parker Lord

David Brandt
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Domenico Solazzo
Vice President – Product Segment Thermal Management
I Woco Group

Bret Trimmer
Applications Engineering Manager
I NeoGraf Solutions

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Wim Dexters
Sales Engineering Director, Americas
I bdtronic Americas

Priyanka Murthy
Business Development Engineer, EV Battery
I tesa

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Automotive Principal Field Applications Engineer
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Alex Kosyakov
Founder & CEO
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Laura Polchinski
Technical Laboratory Chemist
I University of Illinois Urbana-Champaign / Wacker Chemie

Adrian Serna
Business Development Specialist
I AdvanTech International

Priyanka Bhattacharya
Sr. Manager, Battery R&D
I Blue Current, Inc.

Rich Byczek
Global Technical Director, Transportation Technologies
I Intertek

Adam Forti
Global Business Development Engineer
I Stanley Black & Decker, Inc.

Khaled Rashwan
Automotive OEM Business Development Manager
I Evonik

Tom Clark
NA Battery Technology Leader **I DuPont**

Khoren Sahagian
Key Account Technologist and Business Development Manager **I plasmatreat**

Alexander Heitbrin
R&D Director
I Erwin Quarder

Sumin Zhu
Co-founder and CEO
I Ampcera Inc.

Thomas Klama
Application Engineer
I ARNOLD Fastening Systems, Inc.

Joerg Pecho
Director Functional Parts Pre-Series Production **I ARNOLD Fastening Systems, Inc.**

Rutooj Deshpand
Sr Manager, Battery Modeling and Integration
I Rivian

Ahmad A. Pesaran
Chief Energy Storage Engineer
I National Renewable Energy Laboratory

Asim Hussain
Chief Marketing Officer
I QuantumScape

David A. Flannery
Global Segment Manager New Growth Initiatives
I Cabot

Haixia Deng
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I Xera Energy

Yuhang Chen
HV Battery Design Release Engineer
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THE USA's PREMIER TECHNICAL GATHERING OF **BATTERY THERMAL MANAGEMENT** LEADERS, INNOVATORS AND EXPERTS

Battery Thermal Management Innovation USA is the #1 Conference & Exhibition to match OEM and Battery Manufacturer requirements with expert material, solution, and technology providers.

How To Keep The 'Cost, Performance, And Sustainability' Triangle Balanced And Deliver The Best Result.

Reducing Cost & Complexity: System Level Integration

Following the success over the past 4 annual events, this unique meeting has grown exponentially becoming known as the industry best-in-class technical summit and foremost communication network for BTM practitioners, and in particular Battery Manufacturers and OEMs.

BTM Innovation is the USA's exclusive forum for battery engineers, technologists and experts to collectively address the key challenges and industry innovations surrounding advanced BTMs, materials, technologies, solutions and system integrations; to increase efficiency, range, health, optimise solutions for increasingly demanding and ever advancing battery requirements, whilst reducing complexity and cost.

Curated through intensive research with the OEM community to ensure your learning objectives are met - the conference analyses the most crucial and up to date challenges and benchmarks strategic imperatives such as cost and mass production for next-generation BEV advancement. Attendance will provide you with an unbeatable platform for networking and knowledge sharing, and offer a way to generate new business, or ideas, through the power of information exchange with key decision makers and engineers with a shared purpose.

We welcome you to join over 400 xEV experts gathering this May for the USA's largest technical conference for battery thermal management professionals; and foremost communication network for OEMs, technology and solutions providers alike.

CONFERENCE TOPICS

Optimal Design Of Thermal Management Systems At System Level

Next-Gen Cylindrical Cells: Thermal Management Challenges & Solutions

Immersion Cooling For Thermal Management of Lithium-ion Batteries

Cooling Strategies For/ Managing The Impact Of Fast Charging On Thermal Management Of Battery Pack

BMS, Cooling Innovations, Different Cooling Circuit Layouts

Evaluating Difference Platforms And Architectures For Battery Integration

Heat Sink Optimization

Future Of Battery Pack Design & Integration

Optimal Battery Pack Design & Modularity

Integrating Electronic Components Into The Battery Pack

Breakthroughs & Innovations In Thermal Efficiency: Balancing Performance Of The System

Battery Pack Design And Material Selection

Simulation And Modelling For BEV Safety

Optimization: Predicting Thermal Performance And State Of Health Of Battery Pack

Robust Early Detection Of Thermal Runaway

Thermal Adhesive, Sealant & Bonding Solutions: Disruptive Solutions For Battery Applications

Improving Energy Density And Performance Of EV Battery Packs With Thermal Management Materials & Coatings

The Role of Thermal Interface Materials in Battery Systems (TIMs)

AGENDA 2025

29 MAY 2025 | USA
PALO ALTO, CA

08:00 | Chair's Opening Remarks

Bob Galyen, *CTO NAATBatt , Retired CTO,* ***CATL***

08:20

Grid-First, Vehicle-Second Approach to Battery Lifecycle Optimization

Nathan Saliga, *VP Engineering,* ***ONE | Our Next Energy***

Our Next Energy (ONE) explores the technical and economic viability of deploying high-performance battery systems first in stationary grid applications—where duty cycles are moderate and controlled—before transitioning them into automotive use. By optimizing battery conditioning, usage patterns, and health monitoring from the start, this innovative "Grid-First, Vehicle-Second" model could unlock new standards of durability, lifecycle value, and sustainability.

- Understand how stationary grid applications reduce thermal stress, pre-conditioning batteries for extended performance in high-demand EV environments.
- Analyze differences in heat dissipation, passive vs. active cooling, and degradation rates between grid storage and automotive use.
- Explore predictive thermal modeling, AI-driven health monitoring, and chemistry-specific thermal considerations (LFP, NMC, solid-state) to ensure safe transitions.
- Assess how optimized thermal cycling in stationary storage can improve battery longevity, reduce early failures, and minimize lifecycle CO_2 footprint in EV applications.
- Identify certification, safety, and infrastructure requirements for integrating standardized thermal management strategies across grid and vehicle applications.

08:40

Next-Generation Battery Chemistries: Key Battery Chemistries & Their Thermal Management Challenges

Manufacturers are exploring high-energy-density, safer, and more cost-effective alternatives to traditional lithium-ion batteries. However, each new chemistry presents unique thermal management challenges, that require advanced cooling strategies, new material interfaces, and optimized battery system integration.
This session provides a technical deep dive into the latest solid-state, lithium-sulfur, sodium-ion, and high-nickel batteries, focusing on their thermal properties, heat dissipation challenges, and innovations in cooling systems.

- Lithium Iron Phosphate (LFP) – A Safer, Cooler Alternative
- High-Nickel NMC (Nickel Manganese Cobalt) – The Range Extending Powerhouse
- Solid-State Batteries – High-Energy Density with New Thermal Complexities
- Sodium-Ion Batteries – A Cost-Effective, Thermally Stable Alternative
- Lithium-Sulfur Batteries – High Energy, High Thermal Risks
- Nickel-Cobalt-Aluminum (NCA) – High-Performance, High-Risk Chemistry

09:00

Engineering Immersion Cooling Systems for Next-Generation EV Batteries: Key Challenges in Design, Materials, and Thermal Efficiency

With the push for higher energy density and ultra-fast charging in electric vehicles, immersion cooling is emerging as a viable solution for next-generation battery thermal management. However, widespread adoption remains hindered by complex engineering and material challenges that impact system reliability and scalability. This session provides a deep technical dive into the design, material selection, and thermal optimization of immersion cooling systems for EV battery packs, exploring the fluid-cell interactions, dielectric breakdown risks, and long-term performance trade-offs that manufacturers must address to integrate this technology successfully.

- Assess Material Compatibility & Fluid Dynamics – Understand the impact of dielectric coolants on electrode degradation, separator stability, and cell casing durability.
- Enhance Electrical Safety & Breakdown Prevention – Identify strategies to prevent electrochemical leakage currents and maintain dielectric integrity under high voltage and high current loads.
- Optimize Fluid Containment & Scalability – Evaluate best practices for designing leak-proof, maintenance-friendly cooling loops in modular battery architectures.
- Analyze Performance Trade-Offs – Compare efficiency, cost, and scalability considerations between immersion and traditional cooling approaches, including supply chain constraints for next-gen dielectric coolants.

09:20

Cell Degradation vs. Thermal Management – Rethinking the Approach

Rutooj Deshpande, *Sr Manager, Battery Modeling and Integration,* ***Rivian***

While BTM systems play a crucial role in temperature regulation, they cannot fully compensate for degradation-driven performance losses. With evolving market demands, OEMs must shift toward predictive thermal strategies, degradation-aware cooling models, and integrated material innovations to maximize battery lifespan and reliability.
This session elevates last year's discussion by addressing current industry challenges, including the impact of aggressive fast-charging cycles, the role of AI in predictive degradation modeling, and the influence of new cell chemistries on thermal management strategies.

- Examine the evolving relationship between cell degradation and battery thermal management—understanding why traditional BTM systems alone are insufficient.
- Analyze the thermal impact of ultra-fast charging on cell longevity and explore AI-driven cooling solutions for high-power applications.
- Understand how emerging cell chemistries (solid-state, Li-S, sodium-ion) demand new thermal management approaches to mitigate degradation risks.
- Explore next-generation predictive BMS and AI-driven degradation modeling, leveraging machine learning for real-time cooling adaptation.
- Discuss case studies from leading OEMs on integrating adaptive cooling strategies with degradation-aware BMS for maximized battery longevity and performance.

09:40

Optimizing Fluid-Battery Compatibility in Immersion Cooling Systems: Engineering the Right Match

Immersion cooling is not a one-size-fits-all solution—it is a family of technologies that must be precisely engineered to match both battery pack architecture and coolant properties. A fundamental challenge in implementing immersion cooling in electric vehicles lies in the complex interplay between fluid chemistry, thermal performance, and pack design, where viscosity, mass flow, safety characteristics, and phase-change properties dictate the system's overall efficiency and reliability.

This session will provide a deep technical analysis of fluid selection and its impact on immersion cooling performance, focusing on:
- Different immersion cooling approaches (single-phase vs. two-phase flow, full vs. partial immersion, indirect cooling methods) and their implications for battery pack design.
- The impact of battery pack architecture on coolant behavior—how cell arrangement, cooling channel design, and sealing methods affect thermal uniformity and electrical safety.
- Key fluid properties for optimal performance, including viscosity-mass flow relationship, dielectric strength, flash point, thermal conductivity, and auto-ignition temperature.
- The role of pool boiling and two-phase cooling in high-performance applications—how it influences thermal runaway prevention and system durability.
- Safety challenges in immersion cooling systems, including dielectric breakdown, fluid degradation over time, and material compatibility issues.
- Collaboration between battery designers and fluid manufacturers—why immersion cooling fluid development is integral to Formula 1 and high-performance EV battery systems and how this translates to mass-market EVs.

10:00 | MORNING BREAK

10:40

AI-Driven Innovations In Battery Thermal Management: Optimizing Cooling Efficiency, Safety, and Longevity

AI-powered battery thermal management is revolutionizing cooling optimization, predictive maintenance, and failure prevention, offering adaptive, self-learning, and cost-efficient solutions. Explore cutting-edge AI applications in battery cooling system design, real-time temperature regulation, and predictive safety algorithms, addressing the challenges of overheating, energy loss, and long-term battery degradation.

- Leverage AI for Adaptive Cooling & Thermal Control – Understand how machine learning optimizes coolant flow, fan speeds, and heat dissipation while preventing thermal runaway.
- Utilize AI for Battery Aging & Health Monitoring – Explore AI-driven state-of-health (SoH) predictions, smart thermal balancing for second-life batteries, and waste heat recovery for efficiency gains.
- Optimize AI Integration for Scalable Cooling – Evaluate the cost-performance trade-offs of AI-driven cooling strategies, regulatory compliance benefits, and scalable OEM applications for energy-efficient battery thermal management.

11:00

Solutions for Immersion Cooling in EV Batteries: Testing, Safety, and Performance Validation

Rich Byczek, *Global Technical Director Transportation Technologies,* ***Intertek***

Intertek, a global leader in battery safety and performance testing, provides cutting-edge thermal analysis, dielectric fluid validation, and system reliability assessments to accelerate the development and commercialization of immersion cooling systems. This session will provide a technical deep dive into how Intertek's advanced testing, certification, and validation services support OEMs and battery manufacturers in overcoming thermal, material, and electrical challenges in immersion-cooled EV battery packs.

- Evaluate Dielectric Fluid Stability & Performance – Apply thermal analysis, dielectric strength testing, and long-term degradation assessments to ensure fluid reliability under high-voltage and thermal cycling conditions.
- Assess Material Compatibility & Safety Compliance – Analyze corrosion, swelling, and electrode degradation risks while aligning with global safety regulations for immersion cooling applications.
- Enhance High-Voltage Safety & Thermal Runaway Prevention – Identify electrochemical leakage risks, dielectric breakdown challenges, and immersion cooling's role in mitigating fire propagation.
- Ensure System Reliability & Scalability – Develop best practices for seal integrity, leakage prevention, and cost-efficiency trade-offs in large-scale immersion cooling validation programs.

11:20

Designing BMS With Machine Learing (ML) For Thermal Runaway Detection

Jason Skoczen, Sales Director, *Lightspeed and Transportation,* ***Avnet***

This session will provide a deep technical dive into how ML-driven algorithms, real-time sensor fusion, and predictive modeling can transform thermal runaway prevention, ensuring greater vehicle safety, regulatory compliance, and improved battery longevity.

- Understand how AI-driven early warning systems enhance battery safety – Learn how multi-sensor fusion in BMS integrates temperature, pressure, and gas sensors to detect thermal instability before failure.
- Explore predictive ML models for thermal runaway prevention – Gain insights into how real-time battery monitoring and ML pattern recognition can detect early-stage failure trends.
- Learn about low-power ML monitoring solutions – Discover methods to ensure continuous safety monitoring, even when the EV is parked or in storage, preventing missed failure events.
- Analyze real-world case studies on thermal runaway prevention – Review how ML-driven detection systems have successfully identified precursor events, reducing fire risks and catastrophic failures.
- Understand the role of regulatory compliance in AI-enhanced BMS safety – Learn how machine learning meets industry standards and helps manufacturers comply with new safety regulations, including the mandated five-minute warning requirement.
- Examine the future of AI-powered battery safety – Gain insights into emerging patents, industry trends, and the role of AI in developing next-generation EV safety protocols.

11:40

Revolutionizing EV Battery Cooling: Adaptive, Flexible, and Future-Ready

Sebastian Ulbricht, *Head of Business Development North America,* ***Miba Battery Systems***

Unlike conventional rigid cooling plates or heat sinks, flexible thermal management systems use customizable, conformable, or shape-adaptive materials and designs to provide efficient heat dissipation across diverse battery pack configurations.

- Understand Flexible Cooling Principles & Applications – Explore how adaptable liquid cooling systems accommodate various battery cell types and configurations.
- Enhance Battery Performance & Longevity – Assess the role of uniform cooling in improving efficiency, lifespan, and fast-charging capabilities under diverse conditions.
- Evaluate Design & Integration Considerations – Examine the impact of flexible cooling on battery pack architecture, weight reduction, and manufacturing workflows.
- Improve Safety & Reliability – Identify how advanced cooling solutions mitigate thermal runaway risks and enhance overall vehicle safety.
- Analyze Environmental & Economic Benefits – Consider energy efficiency gains, material reductions, and cost-saving opportunities for manufacturers adopting flexible cooling technologies.

12:00

Integrated Thermal Management for EV Electronics: Ensuring Battery Efficiency and System Longevity

Azita Soleymani, *Ph.D. CTO,* ***Heat-Sync***

Inverters, onboard chargers, and DC-DC converters generate substantial heat that, if not properly managed, can reduce battery efficiency, shorten component lifespan, and introduce safety risks. This session provides a technical analysis of the latest innovations in thermal management for high-voltage power electronics, focusing on thermal optimization for inverters, onboard chargers, and DC-DC converters, and their direct impact on battery performance, charging efficiency, and EV safety.

- Optimize inverter heat management to improve battery efficiency and longevity.
- Enhance SiC & GaN cooling for next-gen power electronics.
- Prevent thermal cycling failures in solder joints, PCBs, and TIMs.
- Solve onboard charger overheating in compact designs.
- Compare liquid, air, and hybrid cooling for high-power systems.
- Integrate power electronics and battery cooling for efficiency.
- Prevent high-voltage failures like arcing and dielectric breakdown.
- Improve heat dissipation with advanced TIMs in inverters and converters.

12:20

Lightweight Polymeric Solutions for Thermal & Structural Battery Management: Engineering High-Performance Cooling Systems for Next-Gen EVs

David Schmitz, *Segment Manager, Automotive emobility,* ***Evonik***

Traditional metal cooling components in battery packs add weight, limit design flexibility, and introduce corrosion risks, impacting efficiency, cost, and long-term durability. Attendees will gain a deep technical understanding of how advanced polymeric cooling systems are being designed for modular battery packs, cell-to-pack (CTP), and cell-to-chassis (CTC) architectures, improving energy efficiency, manufacturability, and long-term reliability in next-generation EV battery systems.

- Leverage Polyamide Tubing for Battery Cooling – Understand the benefits of replacing metal coolant lines with lightweight, flexible polymer-based tubing while ensuring chemical compatibility and manufacturing efficiency.
- Optimize Thermal Performance with Composite Cooling Solutions – Compare the heat transfer efficiency of polymer-based cooling channels vs. traditional materials and explore integrated cooling solutions for structural battery housings.
- Address Thermal Challenges in Next-Gen Battery Architectures – Develop cooling strategies for Cell-to-Pack (CTP) and Cell-to-Chassis (CTC) designs, enhancing thermal efficiency and scalability across EV platforms.
- Ensure Reliability, Safety, and Sustainability – Assess crash safety, fire resistance, regulatory compliance, and end-of-life recyclability of polymer-based thermal management solutions.

12:40

Advanced Heat Scavenging & Waste Heat Recovery

As battery energy density increases and fast-charging becomes more common, thermal regulation demands more power, impacting vehicle range, efficiency, and overall energy usage. This session provides a deep technical analysis of heat recovery strategies in EV battery systems, covering innovations in thermally regenerative BTMS, phase-change heat storage, and integrated heat-exchange architectures. Attendees will explore how next-generation energy recapture systems can optimize cooling efficiency while reducing energy drain from active cooling systems.

- Quantify and analyze waste heat sources in EV powertrains – Identify where heat is lost in battery systems, inverters, and power electronics, and explore strategies for efficient thermal energy recapture.
- Optimize battery heat recovery and integration with vehicle thermal loops – Leverage powertrain-generated heat for battery pre-conditioning, reducing auxiliary power consumption and improving efficiency in extreme temperatures.
- Evaluate phase-change materials (PCMs) and thermal storage solutions – Compare PCM vs. thermal capacitors for peak load balancing and assess material selection for efficient heat buffering.
- Enhance ultra-fast charging efficiency through waste heat management – Develop strategies to mitigate heat buildup at >350 kW charge rates and integrate heat-exchange systems into charging infrastructure.
- Utilize AI-driven thermal optimization – Implement machine-learning algorithms for adaptive heat recovery, self-regulating cooling loops, and predictive maintenance insights for long-term system efficiency.

13:00 | LUNCH BREAK

14:00

Adhesive Innovations for Cell-to-Chassis (CTC) Battery Integration: Bonding Solutions for Next-Generation EV Platforms

Tom Clark,** NA Battery Technology Leader, Transportation Technologies, **Dupont

The shift toward Cell-to-Chassis (CTC) battery architectures is redefining how electric vehicle (EV) battery packs are designed, integrated, and thermally managed. By bonding battery cells directly to the vehicle's chassis using structural adhesives, manufacturers can eliminate redundant enclosures, reducing weight, increasing energy density, and improving vehicle dynamics. However, this approach introduces significant engineering challenges, particularly in managing thermal expansion mismatches, mechanical durability, crash safety, and long-term adhesive integrity.

- Understand the role of advanced adhesives in enabling structural, lightweight Cell-to-Chassis (CTC) battery integration.
- Analyze the challenges of thermal expansion mismatches and explore solutions for enhancing bonding durability under extreme temperature conditions.
- Evaluate the latest crash-resistant and fire-retardant adhesive formulations for safety and regulatory compliance in next-generation EV platforms.
- Learn how functional adhesives can enhance battery cooling by improving heat dissipation in CTC architectures.
- Gain insights into scalable manufacturing techniques for integrating adhesives into high-volume EV production.

14:20

Optimizing EV Battery Design With Digital Twins: An Incremental Engineering Approach

Mathias Schmid,** SIMULIA Sales Senior Manager, **Dassault Systèmes

Svetlana Jeronimo,** SIMULIA Industry Process Consultant Manager, **Dassault Systèmes

Battery cell design optimization is intricate, involving a multitude of design parameters such as cell geometry, electrode micro-structure, and materials properties.These parameters often have conflicting effects on key requirements. For example, increasing electrode thickness can enhance energy density but may come at the expense of fast-charge capability.This presentation demonstrates the effectiveness of an incremental engineering approach using digital twins in optimizing battery cell design against vehicle requirements.Focusing on battery cells' electrochemical performance, It will demonstrate how a digital twin approach helps navigate the complexity of battery cell design optimization.

- Trade-off potentially conflicting design parameters early on
- Predict the impact of li plating on fast-charge capability
- Utilize vehicle-level simulations to identify specific requirements at the cell level
- Employ a fast system simulation approach for the initial cell design phase
- Advance to a detailed 3D simulation approach to refine the battery cell design

14:40

Surface-Functionalized Graphene Coatings for EV Battery Thermal Management: Enhancing Fluid Compatibility and Preventing Agglomeration

Bret Trimmer,** Applications Engineering Manager, **NeoGraf Solutions

Graphene-based thermal coatings offer superior heat dissipation, lightweighting, and durability, making them a promising innovation for battery cooling systems and power electronics. However, graphene's tendency to agglomerate and its limited compatibility with cooling fluids pose significant challenges in liquid-cooled and immersive cooling architectures. This session provides a look into the development of surface-functionalized graphene coatings, engineered to enhance fluid compatibility, prevent aggregation, and improve long-term stability in EV battery cooling applications.

- Address Agglomeration Challenges – Identify strategies to prevent graphene particle clumping in cooling fluids and coatings, ensuring uniform dispersion for optimal heat transfer.
- Enhance Fluid Compatibility & Stability – Explore surface functionalization techniques that improve graphene integration with water-based and dielectric cooling fluids while maintaining electrochemical stability.
- Optimize Thermal Conductivity & Heat Transfer – Evaluate advanced graphene-based thermal interface materials (TIMs) and hybrid composites for efficient battery cooling without compromising durability.
- Scale Manufacturing & Application Techniques – Assess cost-effective production methods, including roll-to-roll and spray-assisted coatings, for seamless integration into liquid, air, and immersion cooling systems.
- Apply Real-World Insights – Analyze case studies demonstrating the long-term performance and thermal efficiency of graphene-enhanced coatings in EV battery cooling applications.

15:00

Solid-State Battery Thermal Management: Overcoming Heat Dissipation Challenges in Next-Generation EV Batteries PANEL DISCUSSION:

While solid electrolytes eliminate flammable liquid components, they introduce new heat dissipation challenges, including higher internal resistance, localized overheating, and interfacial thermal bottlenecks that can impact battery performance, longevity, and fast-charging capabilities.
This session provides a technical deep-dive into the thermal management challenges of solid-state batteries, exploring heat dissipation strategies, solid electrolyte thermal behavior, and cooling integration methods for next-generation EV architectures.

- How does the absence of liquid electrolytes in solid-state batteries impact heat generation, dissipation, and overall thermal resistance compared to conventional lithium-ion batteries?
- What are the key thermal bottlenecks at solid-state battery interfaces (electrode-electrolyte, electrolyte-current collector), and how can material innovations enhance heat dissipation while maintaining electrical insulation?
- Given the higher internal resistance of solid electrolytes, what cooling strategies—such as phase change materials, immersion cooling, or integrated heat sinks—are most effective for thermal regulation in EV applications?
- How do solid-state batteries handle fast charging from a thermal perspective, and what design modifications or temperature regulation techniques can enable safer and faster charging without accelerating degradation?
- What challenges do scalability and manufacturing introduce in maintaining uniform thermal properties across large-format solid-state battery cells and packs, and how can advanced production techniques improve thermal performance?
- While solid-state batteries eliminate liquid electrolyte flammability, what new thermal safety risks arise (e.g., lithium dendrites, thermal runaway mechanisms), and how should EV thermal management systems adapt?

15:20

Next-Generation Anode & Cathode Materials: Thermal Management Innovations for High-Performance EV Batteries

Advancements in anode and cathode materials are driving improvements in energy density, charging speed, and overall efficiency. However, new material chemistries introduce unique thermal management challenges, requiring innovative cooling strategies, enhanced heat dissipation methods, and optimized safety protocols.

This session explores next-generation anode and cathode materials, exploring how silicon anodes, high-nickel cathodes, lithium iron phosphate (LFP), and solid-state electrolytes impact thermal performance, thermal runaway risks, and cooling system design.

- Assess Thermal Challenges in Advanced Anode & Cathode Materials – Examine how silicon anodes, high-nickel cathodes, solid-state electrolytes, LFP, and synthetic graphite impact battery heat generation, stability, and cooling requirements.
- Optimize Fast-Charging Thermal Strategies – Understand how material-induced heat buildup affects battery longevity and explore solutions such as graphene-enhanced composites, phase-change materials, and advanced cooling techniques.
- Leverage Cutting-Edge Thermal Management Innovations – Explore the role of thermal interface materials (TIMs), fire-resistant coatings, liquid cooling advancements, and hybrid cooling strategies in next-generation battery packs.
- Adapt Thermal Management for Different Battery Chemistries – Learn how varying material properties, from LFP's thermal stability to solid-state interfacial resistance, influence cooling architecture design.
- Apply Real-World Thermal Management Best Practices – Analyze case studies demonstrating effective cooling solutions in high-performance EV battery applications.
- Anticipate Future Trends in Battery Materials & Cooling Architectures – Discuss how emerging material innovations will shape next-gen EV platforms and thermal regulation strategies.

15:40

Developing Battery Cell Specifications: Balancing Chemistry, Performance, and Thermal Management for Scalable Commercialization

Maithri Venkat, *Manager—Battery Cell Lifetime and Parameterization,* ***Lucid Motors***

Defining battery cell specifications for electric vehicles is a critical step in ensuring optimal performance, safety, thermal stability, and cost-efficiency. As cell chemistries advance and vehicles demand higher energy density, faster charging, and extended lifespans, engineers must carefully balance material choices with thermal management strategies, manufacturability, and supply chain limitations.
A technical look into the process of translating advanced cell chemistry innovations into commercially viable EV battery designs, focusing on the thermal implications of high-performance cells, lifecycle optimization, and system integration for scalable production.

- Understand how battery cell thermal behavior influences specification development for electric vehicles.
- Learn how to integrate thermal management targets into cell design parameters, including energy density and fast-charging performance.
- Examine the role of advanced chemistries in shaping thermal, mechanical, and lifecycle performance.
- Analyze best practices for balancing safety, performance, and manufacturability in cell specification development.
- Gain insights into real-world challenges of scaling innovative cell chemistries, with a focus on thermal stability and system-level integration.

16:00 | AFTERNOON BREAK

16:30

Scaling Battery Swapping For xEVs: Overcoming Thermal Management And Grid Integration Challenges

Dr.-Ing. Yong Wang, *Head of EU Power Swap Product Management,* ***NIO***

Battery swapping delivers fast, flexible energy for EVs—but brings big challenges. Thermal management, grid integration, and scalability are key hurdles, along with standardization, battery degradation, and economic viability. This session dives into the critical obstacles and innovative solutions shaping the future of battery swapping.

- Analyze the impact of frequent battery swaps on temperature regulation and long-term battery performance.
- Explore strategies to optimize cooling and heating within battery swap stations for efficiency and safety.
- Examine how battery swap stations function as decentralized energy storage units.
- Discuss the challenges of bidirectional power flow and its impact on grid stability.
- Understand the role of bidirectional power modules in improving station energy efficiency.
- Explore heat recovery and distribution strategies to reduce energy loss and enhance station sustainability.
- Discuss the long-term potential of battery swapping in transforming EV infrastructure.

16:50

Immersion Cooling As A Paradigm Shift In High-Power BTM For Extreme Duty Applications

Sean Chiang, *Business Development Manager,* ***XING Mobility***

A deep technical analysis of immersion cooling technology, evaluating its performance in maintaining thermal stability, improving charge/discharge efficiency, and mitigating thermal runaway propagation across high-energy lithium-ion battery modules.

We will compare direct immersion dielectric fluid systems with traditional cold plate and indirect liquid-cooled architectures, focusing on thermal conductance coefficients, transient heat rejection rates, and lifecycle degradation patterns under high C-rate cycling.

- Integrate immersion cooling in modular battery pack designs – Learn how to optimize immersion tank integration, select suitable dielectric fluids, and improve coolant flow for maximum heat dissipation.
- Enhance thermal performance under high load conditions – Compare immersion cooling vs. cold plate systems at high discharge rates, analyze heat rejection in >600 kW applications, and evaluate thermal gradient reduction during fast charging.
- Address long-term degradation and maintenance – Understand chemical interactions between dielectric fluids and cell casings, implement fluid filtration and replacement strategies, and predict coolant lifespan in real-world conditions.
- Leverage CFD and multi-physics simulations for system optimization – Use flow dynamics modeling and coupled electro-thermal simulations to identify hotspots, validate experimental data, and scale immersion cooling for large-format battery packs.

17:10

Fractional Thermal Runaway Calorimetry (FTRC): A Breakthrough in Understanding and Mitigating Lithium-Ion Battery Thermal Events

Exponent, Inc. TBC

Traditional thermal characterization methods lack the resolution needed to quantify how heat and energy are distributed during a failure event, making risk assessment and mitigation strategies difficult to optimize.

NASA's Fractional Thermal Runaway Calorimetry (FTRC) is an advanced analytical technique that quantifies the total thermal energy released during a runaway event and breaks it down into conduction, ejecta, and gas-phase contributions. This session provides a technical deep dive into how FTRC is revolutionizing thermal runaway analysis, enabling engineers to refine safety models, improve battery designs, and develop more effective containment and thermal management solutions.

- Understand the principles of Fractional Thermal Runaway Calorimetry (FTRC) and how it improves traditional thermal analysis methods.
- Analyze how FTRC quantifies energy pathways—conduction, ejecta, and gas release—and why these measurements are critical for designing safer battery systems.
- Learn how to apply FTRC data to enhance battery pack safety, optimize cooling strategies, and improve containment structures.
- Examine case studies on how leading battery manufacturers and researchers are using FTRC to refine their thermal management and safety protocols.
- Explore how FTRC testing supports compliance with UL 9540A, NFPA 855, and other global battery safety regulations.

17:30

Inside The Warning Zone: Advancing Gas Sensing For EV Battery Safety

This session will examine how automotive-grade metal oxide (MOX) sensors enable real-time, low-power, and reliable early warning systems across diverse EV battery architectures. Attendees will gain insights into the technical requirements of integrating gas sensors directly into battery packs, including challenges around sensitivity, durability, and communication with the vehicle's BMS.

- Understand the critical gas indicators of thermal runaway and how early detection prevents failure propagation.
- Explore the technical challenges of integrating gas sensors into EV battery systems, including packaging, signal reliability, and power consumption.
- Assess the balance between sensor sensitivity and energy efficiency to ensure robust, real-time monitoring.

- Gain insights into emerging trends in battery diagnostics and the role of gas sensing in next-generation safety strategies.

17:50

Integrated Thermal Management for Batteries, Power Electronics & eMotors: Balancing Cooling Efficiency, Performance & Safety in Next-Gen EV Powertrains

Traditionally, battery thermal management (BTMS) has focused on the battery pack itself, but EV manufacturers are increasingly identifying power electronics and electric motors as key sources of heat that impact overall system efficiency, cooling strategies, and energy consumption.

- Understand the thermal interdependencies between EV batteries, power electronics, and eMotors, and how they impact overall system performance.
- Analyze the challenges of managing high-power inverters (SiC/GaN), onboard chargers, and DC-DC converters in high-voltage architectures.
- Explore cooling strategies for high-performance eMotors, including liquid cooling, oil spray cooling, and integrated thermal loops.
- Evaluate the role of heat scavenging and energy recovery to improve battery pre-conditioning, charging efficiency, and overall range.
- Examine AI-driven predictive cooling technologies, sensor fusion, and real-time adaptive cooling for optimized energy efficiency.
- Discuss case studies on how leading OEMs and Tier 1 suppliers are integrating unified thermal management strategies into next-generation EV platforms.

18:30

Advanced Control Strategies: Optimizing Cooling, Efficiency, and Safety Through Intelligent Thermal Regulation

Battery thermal management systems (BTMS) are becoming increasingly complex, requiring precise, real-time control to balance temperature regulation, energy efficiency, and battery longevity. EV manufacturers are highlighting controls as a key industry pain point because thermal management is no longer a passive system—it must be intelligent, predictive, and dynamically responsive to changing conditions. Control strategies for battery thermal management, focusing on real-time sensor fusion, AI-driven predictive cooling, thermal load balancing, and BMS integration.

- Understand the role of advanced thermal controls in improving cooling efficiency, energy consumption, and battery longevity.
- Learn how AI-driven predictive cooling and sensor fusion can enhance real-time battery temperature regulation.
- Analyze strategies for managing thermal loads during ultra-fast charging and high-discharge events.
- Examine how integrated BMS and thermal controls improve early fault detection and battery safety.
- Explore innovative approaches for coordinating battery, power electronics, and HVAC cooling in shared thermal circuits.

18:30

Thermal Management for Second-Life & Recycling Applications: Adapting Cooling Strategies for Aging Battery Packs

Aging batteries require fundamentally different thermal management strategies compared to newly manufactured packs. As second-life batteries are repurposed for stationary energy storage applications, their degraded thermal conductivity, increased internal resistance, and variable cell chemistries introduce unique cooling challenges. Traditional thermal management solutions designed for uniform and high-performance EV packs are often ineffective in these applications, necessitating new, adaptive cooling strategies.

This session will provide a deep technical analysis of second-life battery thermal management and explore cutting-edge innovations in AI-driven optimization and modular cooling platforms, focusing on:

- Thermal variability in aged cells – How uneven degradation across repurposed battery packs leads to inconsistent heat generation, increased internal resistance, and localized hot spots, requiring more granular, cell-level cooling solutions.
- Decreased thermal conductivity and cooling efficiency – The impact of electrolyte aging, deteriorated thermal interface materials, and compromised heat dissipation on second-life battery performance, and how advanced cooling architectures can mitigate these challenges.
- Heterogeneous battery chemistries and architectures – The difficulties posed by mixed battery packs with varying states of health, energy densities, and form factors, and how modular cooling strategies can be adapted for diverse applications.
- Cost-effective thermal management for second-life applications – Evaluating the trade-off between performance, safety, and affordability in retrofitting cooling systems for repurposed battery modules.
- AI-driven thermal optimization for second-life batteries – How machine learning algorithms and predictive analytics can dynamically regulate cooling strategies based on real-time thermal and electrochemical data.
- Modular and scalable cooling platforms – The development of adaptable cooling systems, such as hybrid phase-change materials, passive air cooling, and reconfigurable liquid cooling, to enhance thermal stability in stationary storage applications.
- Safety and regulatory considerations in second-life battery cooling – Addressing the risks of thermal runaway, dielectric breakdown, and thermal runaway propagation in aging cells, and how emerging safety standards influence cooling system design.

This session will bring together industry experts in battery recycling, second-life applications, AI-driven thermal management, and energy storage system design to discuss the latest innovations and strategies for optimizing thermal performance in repurposed EV batteries.

18:50

Intelligent Thermal Load Balancing: Achieving Uniform Cooling During High-Current Events

The challenges of thermal load balancing during ultra-fast charging, exploring adaptive cooling strategies, predictive thermal controls, dynamic heat redistribution, and advanced cooling architectures designed to handle high-energy transfer rates while optimizing heat rejection efficiency.

- Analyze the impact of ultra-fast charging on thermal load distribution and the risks of localized overheating, cell imbalance, and premature degradation.
- Understand adaptive cooling techniques such as liquid immersion, active heat pumps, and phase-change cooling to manage high-power thermal loads efficiently.
- Evaluate AI-driven predictive cooling algorithms and thermal sensors that dynamically adjust heat extraction and distribution during charging events.
- Examine heat scavenging and waste heat recovery strategies for enhanced energy efficiency in ultra-fast charging scenarios.
- Explore real-world case studies of successful ultra-fast charging thermal management implementations from leading EV manufacturers and suppliers.

19:10

Software-Defined Thermal Management: BMS, Power Electronics, & HVAC Coordination

Automotive OEMs and battery manufacturers have identified software as a major challenge, as next-generation thermal management systems must go beyond passive cooling and integrate AI-driven, real-time predictive control strategies.

- Understand how software-driven algorithms dynamically manage coolant flow, fan speeds, and compressor activation to maintain optimal battery temperature, efficiency, and safety.
- Explore machine learning models that analyze real-time sensor data to detect early signs of thermal issues, preventing battery degradation, overheating, and failures.
- Learn how software-based thermal mapping and intelligent charge distribution prevent localized overheating, improve cooling efficiency, and extend battery lifespan in high-power charging scenarios.
- Examine how BMS, power electronics, HVAC, and regenerative heat recovery systems coordinate through software-defined thermal control to improve energy efficiency and prevent thermal conflicts.
- Understand how ISO 26262-compliant software validation ensures thermal management reliability, and explore cybersecurity strategies to prevent malicious interference or software failures.
- Learn how remote software updates enhance battery thermal control strategies, improving charging performance, efficiency, and system safety over time.

19:30

Enhancing Battery SOC & SOH Accuracy: The Hidden Impact of Sensor Errors & Latency

Gregory L. Plett, *PhD, Professor, Electrical & Computer Engineering,* ***University of Colorado, Colorado Springs***

Accurate and reliable estimation of State of Charge (SOC) and State of Health (SOH) is critical for optimizing lithium-ion battery performance, safety, and longevity. These parameters cannot be directly measured and must instead be estimated through model-based algorithms that rely on sensor inputs such as voltage, current, and temperature. However, the accuracy and confidence of these estimates are highly sensitive to sensor measurement errors, precision, accuracy, and latency.

This session will present a technical deep dive into the effects of sensor inaccuracies on SOC and SOH estimation. Through high-fidelity model-based simulations, the talk will quantify how different levels of measurement error and timing delays impact the reliability of battery diagnostics and management systems.

- Understand the impact of sensor errors on SOC and SOH estimation accuracy, including the role of voltage, current, and temperature measurement precision.
- Analyze the effects of latency and synchronization in sensor data on real-time battery management and performance stability.
- Evaluate model-based simulations to quantify SOC and SOH deviations under varying sensor fidelity conditions.
- Compare estimation techniques such as EKF, UKF, and neural network-based models for robustness against sensor inaccuracies.
- Identify critical failure thresholds where sensor errors lead to miscalculated battery health and safety risks.
- Explore strategies for improving SOC and SOH estimation, including sensor calibration, real-time error correction, and advanced algorithmic compensation

19:50

Innovative Balance-of-Plant (BoP) Components for High-Power PEM Fuel Cell Systems

Michael Harenbrock, *PhD, Principal Expert, Engineering Electric Mobility,* ***MANN+HUMMEL GmbH***

As fuel cell systems scale beyond 200 kW, the demands on Balance-of-Plant (BoP) components increase significantly. Achieving cost efficiency, system longevity, and peak energy performance requires innovative solutions in cathode air paths, cooling loops, and water management.

This session will explore next-generation BoP components engineered for 200-400 kW PEM fuel cell systems, addressing the latest advancements in:

- Optimized cathode air paths for improved efficiency and durability.
- Advanced cooling loop designs to enhance thermal regulation and longevity.
- Breakthrough humidifier technologies ensuring precise moisture control.

Innovative anode water separator designs for better system integration and reliability.

20:10

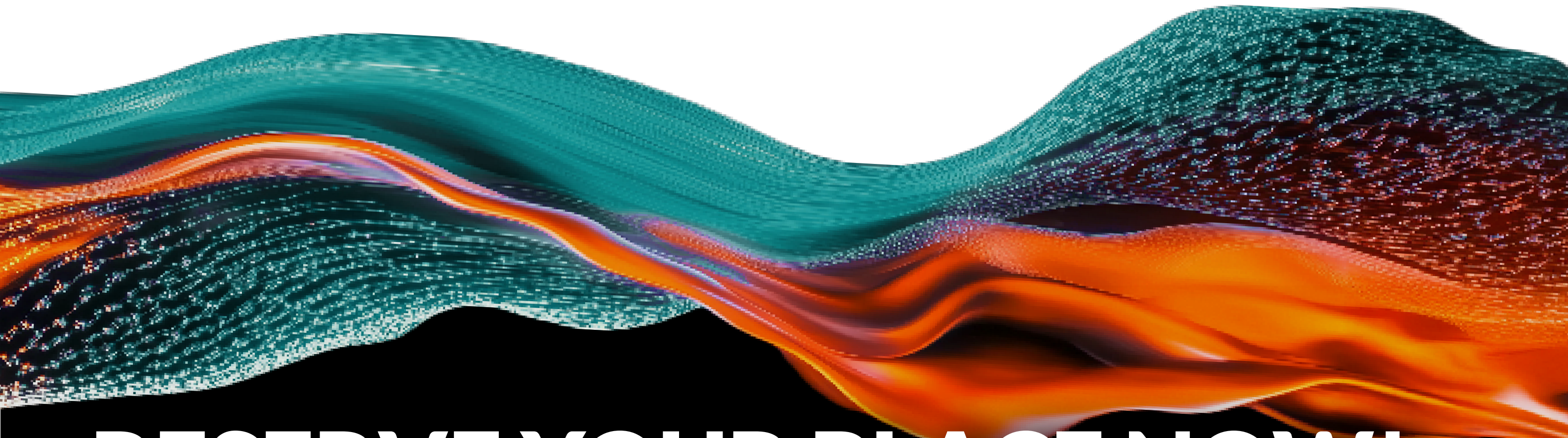
Extreme Thermal Demands in eVTOL Batteries: Managing High-Power Cycles, Weight Constraints & Safety Risks

The unique operational demands of electric Vertical Take-Off and Landing (eVTOL) aircraft place extreme requirements on battery thermal management systems (BTMS). Unlike ground-based EVs, eVTOL batteries must handle high power discharge rates, rapid charge cycles, and extreme environmental conditions, all while maintaining strict weight, space, and safety constraints.

This session will provide a deep technical exploration into the key challenges and innovations in thermal regulation strategies for eVTOL battery packs. Experts will discuss how cutting-edge cooling technologies, thermal runaway prevention methods, and advanced thermal modeling techniques are shaping the future of eVTOL battery design.

- Understand the impact of high thermal loads during rapid discharge cycles, particularly in peak power demand phases such as takeoff and landing.
- Evaluate advanced cooling solutions, including liquid cooling and phase-change materials (PCMs), for efficient heat dissipation in eVTOL battery systems.
- Analyze weight and space trade-offs in battery cooling, comparing active (liquid, air, refrigerant) and passive (PCM, heat pipe) approaches to optimize thermal management.
- Explore strategies for thermal runaway prevention, including AI-driven predictive monitoring, smart thermal sensors, and advanced fire-resistant containment materials.
- Assess the influence of extreme environmental conditions on battery performance and explore adaptive thermal management strategies for high-altitude, cold weather, and high-temperature operations.
- Examine the challenges of ultra-fast charging in high-utilization eVTOLs and investigate novel dielectric coolant and immersion cooling techniques to prevent overheating.

20:30 | Chair's Closing Remarks



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- All attendee evening drinks reception – open bar

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- All attendee evening drinks reception – open bar

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Position your company as a thought leader by sharing your latest innovations, insights and best practices on the electric vehicle battery recycling stage. Demonstrate your expertise through presentations, panel discussions and technical workshops to establish your company as an innovative industry leader.

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Chief Engineer, Chief Scientists, **Head of Research,** Thermal Management – Battery Systems, **Vice President Battery Cell Process & Manufacturing Engineering,** Electrochemist, Advanced Battery Cell Engineering, **Materials and Manufacturing,** Battery Module Thermal Management, **Simulation engineer/ HV Battery thermal management,** Director High Voltage Battery Systems, **Battery Management Systems Engineer,** Director Battery Pack Design and Thermal Management, **Chief Engineer,** Battery Systems Management Engineer, Sr. Adv. Battery Modeling Engineer, **Sr. Staff Battery Cell Engineer,** Senior Project Manager, **Battery Cell ManufacturingFluids and Thermal Management,** R&D Engineers, **Thermal Management Lead Engineers,** Electrified Powertrains, Battery Research and Systems Engineers, **HV Battery Design and Testing,** Chief Engineer, **Thermal Management HV Components, Thermal Management Modules Battery Electrical Vehicles,** Battery Management Systems (BMS) Designer, **Battery Management Systems (BMS) Engineer,** Chief Technology Officer, Senior Mechanical Engineer, **Materials Engineer,** Powertrain Project Management, **Senior Thermal Multi-Physics Engineer,** Energy Storage Systems (ESS) Safety Engineer, **Technical Specialist,** Hardware Engineering, Director Product Manager, **Director of Advanced Thermal Systems and Technology,** Battery Safety Engineer, **Senior Battery Technology Engineer,** Director – Manufacturing Engineering, **Senior Cell Engineer,** Lead Engineer Thermal Management System, **Thermal Management Research Engineer,** Projecthouse Thermal Management Modules, **Head of EV Battery Systems,** Thermal CFD Engineer, Predictive Thermal Management High-Voltage Battery, **Senior Engineer – Virtual Design Development and Verification, Electrification Battery Thermal, Technical Lead – Thermal Management,** Analyst – Battery Thermal Management, **Team Leader – Battery Modeling and Diagnostic,** R&D (Battery Thermal System), Thermal Management CAE Engineer, **Senior Manager- Battery Thermal Simulations,** Battery Packs – Electrical, **Mechanical Thermal components Team Leader,** HV Battery Cell Vent Management Supervisor, Senior Director, **Battery Storage,** Platform Battery Thermal Management Process engineering, **Director Thermal Management HV-Battery,** Director Battery System Product & Platform Management, **EV-Battery Production and Production Planning,** Thermal Systems Architecture Engineering, **Thermal Simulation Lead,** Director of Battery Cell and Module Technology