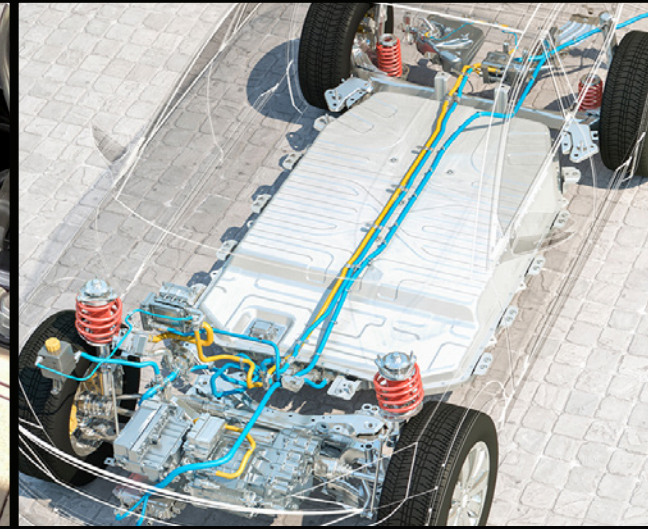
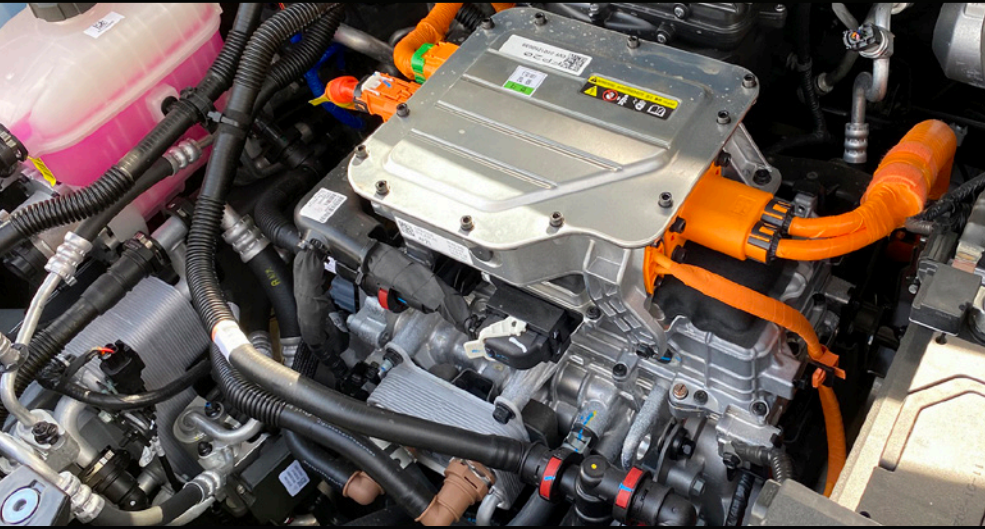




**In-Person June 16, 2022**



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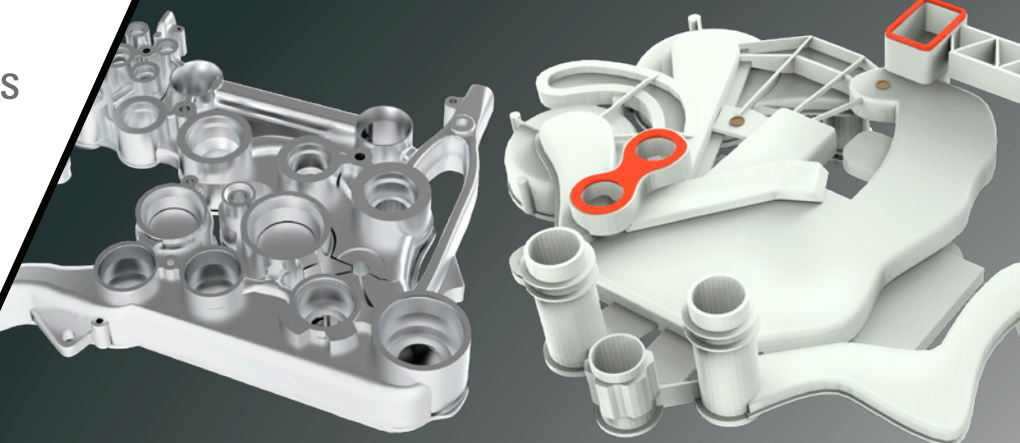
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**Final Program**



# Thermal Management Systems and Materials 2022

**7:30 a.m. Registration, Networking and Continental Breakfast**

**8:10 a.m. Regulations and Market Changes Lead to Vehicle Thermal Management Priorities**

*Mr. Sean Osborne, Vice President*

**The ITB Group**

Regulations changes are driving a shift to electrified vehicles and fuel saving thermal technologies. The market shift is leading to new system designs for improved performance and lower cost. This presentation will discuss the developmental priorities for powertrain and passenger comfort thermal technologies.

## Vehicle Thermal Systems

**8:25 a.m. Introduction of a Lightweight and Compact Exhaust Heat Recovery System**

*Manager, Sales/NM Purchasing/Engineering*

**YUTAKA GIKEN**

Using waste heat from exhaust gas is an effective measure to improve fuel efficiency of ICE equipped vehicles. Additionally, an exhaust heat recovery system (EHRS) can qualify for US EPA GHG off-cycle credits. In this presentation, a lightweight and compact EHRS design using an efficient SiC honeycomb core will be introduced.

**8:55 a.m. Heating Technologies and Systems for Vehicle Applications**

*Global Technical Director*

**Zoppas Industries**

Heating is important for improving comfort plus efficiency of ICE and electrified vehicles. Electric vehicles have unique challenges related to heating in cold ambient conditions, with vehicle range drops of over 50%. This presentation addresses advanced vehicle developments combining heating and other functions for improved comfort and safety, as well as energy efficiency.

**9:25 a.m. The Future of Vehicle Thermal Management Systems**

*Manager Product Portfolio Americas -*

**Röchling Automotive**

This presentation examines the future of thermal system designs. What are the requests from the market? The focus will be on which existing products and technologies, can be re-used and what must be newly developed.

**9:55 a.m. Networking Break**

**10:40 a.m. KEYNOTE ADDRESS**

**Effective BEV Thermal Management with Flow Control Modules**

*Head of Sensing & Actuation, Fluid Control Systems, and Head of Product Line Actuators*  
**Vitesco**

There is a heightened need for effective thermal management of electric vehicle (EV) systems and components. The need for additional system features – both comfort and function driven – leads to an increase in EV architectural complexity as well as related thermal strategies. Autonomous driving brings another layer of

thermal challenges. Therefore a system-based approach for developing thermal management components and modules is necessary.

**11:10 a.m. High-Power-Density Thermal Management for Electric Vehicles**

*Professor, Lab Director and Ph.D. candidate*

**Purdue University**

Advances in electric vehicle (EV) applications are increasingly associated with dissipation of large amounts of heat at device, sub-system, and system levels. This presentation will summarize high-power-density cooling schemes and industrial applications. Research into EV charging and thermal management includes cooling of charging cables, batteries, motors, and power electronics, and fuel cells. Recent development of a liquid-to-vapor phase change EV charging cable, with 2400 Amp capability, will be highlighted.

## Materials for Electrified Vehicle Thermal Systems and Components

**11:40 a.m. Friction Stir Welded Liquid Cooled Heatsinks: A High Efficiency, Low-Cost Solution**

*CEO*

**Stirweld**

This presentation will describe the combination of aluminum die casting and Friction Stir Welding to develop high efficiency and low-cost liquid cooled heatsinks for EV thermal management. Extensive knowledge and experience on various EV components will be conveyed. Golden design rules and quality control procedures for component development will be described.

**12:00 p.m. Lunch**

**1:00 p.m. Thermoplastic Refrigerant Lines for A/C & Heat Pump Applications**

*Advanced Technology Manager*

**TI Fluid Systems**

Reduced underhood temperatures associated with electric powertrains enables the cost-effective conversion of traditional metal and rubber refrigerant assemblies to thermoplastic material. Thermoplastic lines provide significant benefits, including weight reduction. Connection technology is a critical aspect for thermoplastic refrigerant lines. This presentation will discuss failure modes and specification implications.

**1:30 p.m. New Cost-Efficient Plastic Multilayer Tubing Solutions for XEV Thermal Management**

*Business Development Manager*

**Evonik**

In parallel with increasing vehicle electrification, the global share of thermoplastic solutions in thermal systems has been increasing. System requirements, vehicle designs, and cost structures at the OEM and Tier level are continuing to change. Polyamides contribute to lightweighting and packaging improvement for significant greenhouse gas reductions, plus economic benefits. This presentation will show existing and new material developments, with a focus on cost efficient thermal systems for electrified vehicles.



- 1:50 p.m. World-Class Materials for Complex Thermal Management Systems**  
*Application Development Engineer*  
**EMS-GRIVORY**  
Thermal management systems have seen significant changes in complexity, including coolant changes. New demands are prompting development of innovative materials tailored for high temperature, and chemical exposure. This presentation will discuss material selection and development for fluid quick connectors, flow control valves, water pumps, and tubing.
- 2:10 p.m. Performance of DIC.PPS for ICE and Electric Drive System Thermal Management**  
*Commercial Director, Advanced Materials*  
**Sun Chemical Corporation**  
This presentation covers the performance of DIC.PPS in thermal management applications. PPS resin for injection molded or extruded products helps developers achieve improved efficiency and meet tighter emissions regulations limits. Drivetrain thermal management is improved with the use of PPS thermal modules. Components made with thermally conductive DIC.PPS foster improved heat dissipation and temperature control.
- 2:30 p.m. PPS Development for Laser Welding in Thermal Management and HVAC Applications**  
*Transportation Marketing Manager*  
**Solvay Materials**  
When manufacturing and assembling thermoplastic components, joining techniques must be considered to ensure proper system performance. Laser welding is used for clean, robust connections and seals, but is particularly challenging when polymer crystallinity is higher. A new laser weldable PPS material for thermal management applications, including HVAC Lines, and Fuel Cell Coolant Lines will be presented.
- 2:50 p.m. Networking Break**
- 3:20 p.m. Improving a HVAC Duct's Thermal Performance**  
*Engineering Manager and Project Leader*  
**Grammer**  
The benefits of utilizing natural fibers over conventional plastics in an HVAC duct will be discussed. Compared to conventional plastics, the fibers reduce thermal loss and improve duct performance. GRAMMER will also highlight a sustainable manufacturing process technology to utilize natural fibers in HVAC ducts.
- 3:40 p.m. Advanced Bio-Circular Materials for EV Thermal Management and Power Distribution**  
*Business Development Engineer*  
**Arkema**  
For 60 years PA11, with excellent chemical, thermal, and mechanical performance, has been used for demanding automotive applications. Electrified mobility brings new requirements such as electrical isolation & long-life coolant transport. PA11's unique characteristics address such new demands. This presentation highlights mono- and multi-layer material characteristics plus the fit with specific applications. Additionally, PA11 may dramatically reduce a vehicle's carbon footprint and ease recycling.

## Battery Thermal Solutions

- 4:00 p.m. How Cell Monitoring with Electrochemical Impedance Spectroscopy (EIS) Extends Battery Life and Prevents Thermal Runaway**  
*Executive Director of Intelligent Battery Performance Solution*  
**Gentherm**  
Electrochemical Impedance Spectroscopy (EIS) is like sonar where a pulse is sent out and the reflection of the pulse conveys characteristics of objects which can't be seen. As the impedance of a battery cell changes, an image of the condition inside each cell improves the understanding of battery health. With this technology, changes of state, temperature, swelling, and dendrite growth can be recognized earlier for improved battery performance and safety.
- 4:30 p.m. Battery Thermal Propagation Control Strategies and their Impact on Battery Performance**  
*Applications Engineering Manager*  
**NeoGraf Solutions**  
Battery thermal propagation control has major consequences for fast charging, cell cycle life, and driving range. This presentation examines methods to prevent thermal propagation in battery packs with a focus on material alternatives for heat spreading. Flexible graphite heat spreaders are used where a size and mass are critical.
- 4:50 p.m. Compatibility of Elastomer Sealing Materials in Dielectric e-Fluids**  
*Senior Applications Development Chemist*  
**Zeon Chemicals**  
Direct-contact, immersive cooling technology is gaining interest for improved efficiency and uniform thermal control of next-gen EV batteries. Immersive cooling can require the use of non-conductive, dielectric fluids, like polyalphaolefins (PAOs) and dielectric esters. This presentation will introduce an analysis of elastomers used for fluid sealing and their compatibilities with dielectric coolants for EV battery thermal systems.
- 5:10 p.m. Two-phase High-Performance Thermal Management : Direct Evaporative Immersion Technology**  
*Vice President Business Development*  
**Carrar**  
This disruptive, holistic thermal management solution addresses the significant challenges of cooling and heating an automotive battery, powertrain, and electronic components over a wide temperature range. With Carrar's enhanced nucleation solution, optimal boiling occurs at low and high heat fluxes, enabling extremely fast charging and discharging, ensuring uniform temperature at the cell level, preserving battery life, and preventing thermal propagation. The technology is based on two-phase immersion pool boiling for efficient thermal control.
- 5:40 p.m. Closing Remarks and Cocktail Hour**



## Industry-Funded Technical Reports



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