THERMAL MANAGEMENT SYSTEMS

October 15-17, 2019
Plymouth, MI

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Bashar AbdulNour, Wayne State University
Ales Alajbegovic, Dassault Systemes
Jeffrey Bozeman, General Motors LLC
Hector Cano, Bergstrom Inc
Alaa El-Sharkawy, FCA US LLC
James Gebbie, Ford Motor Company
Edward Gerges, Dana-Long Manufacturing
Sowmyalatha Jayaraman, General Motors LLC

Vamshi Korivi, CCDC Ground Vehicle Systems Center
Timo Kuthada, FKFS
Kevin Laboe, FCA US LLC
Jason Lustbader, National Renewable Energy Laboratory
Gursaran Mathur, Calsonic Kansei North America Inc
Christophe Petitjean, Valeo Thermal Systems
Ronald Semel, Ford Motor Company
Kumar Srinivasan, FCA US LLC
Andrew Sutherland, TI Fluid Systems
Leonid Tartakovsky, Technion Israel Institute of Technology
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DURING THE THERMAL
MANAGEMENT SYSTEMS
SYMPOSIUM

During the event attendees are to follow the established emergency guidelines of the facility where the emergency occurs. Based on the location of the incident, report emergencies to the nearest venue representative and/or security personnel if available, or report to the SAE registration area. Should a catastrophic event occur, attendees should follow the safety and security instructions issued by the facility at the time of the event. This includes listening for instructions provided through the public address system and following posted evacuation routes if required.

In the event of an emergency or a major disruption to the schedule of events at the event, attendees and exhibitors may call this number to receive further information about the resumption of this event. Updates will also be provided via the SAE website at www.sae.org.

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## Event-At-A-Glance

**October 15**

**Tuesday**

<table>
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| 8:30 a.m. - 9:00 a.m. | Continental Breakfast  
Exhibit Area  
Sponsored By: GENTHERM |
| 9:00 a.m. - 10:00 a.m. | Keynote: Radu Theyyunni  
The Role of CAE in Vehicle Thermal Management  
Exhibit Area |
| 10:00 a.m. - 10:30 a.m. | Networking Break  
Exhibit Area |
| 10:30 a.m. - 12:00 p.m. | Regulatory Panel Discussion |
| 12:00 p.m. - 1:30 p.m. | Lunch  
Atrium |
| 1:30 p.m. - 3:30 p.m. | Technical Sessions |
| 3:30 p.m. - 4:00 p.m. | Networking Break  
Exhibit Area |
| 4:00 p.m. - 6:30 p.m. | Technical Sessions |
| 6:30 p.m. - 7:30 p.m. | Networking Reception  
Exhibit Area |

**October 16**

**Wednesday**

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<th>Time</th>
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| 8:30 a.m. - 9:00 a.m. | Networking/Coffee  
Exhibit Area |
| 9:00 a.m. - 10:00 a.m. | Keynote: Ted Miller  
Advanced Battery Systems - The Key to Vehicle Electrification  
Exhibit Area |
| 10:00 a.m. - 10:30 a.m. | Networking Break  
Exhibit Area |
| 10:30 a.m. - 11:30 a.m. | Technical Sessions |
| 11:30 a.m. - 1:30 p.m. | Lunch  
Atrium |
| 1:30 p.m. - 3:30 p.m. | Technical Sessions |
| 3:30 p.m. - 4:00 p.m. | Networking Break  
Exhibit Area |
| 4:00 p.m. - 5:30 p.m. | OEM/ Tier I Panel Discussion |

**October 17**

**Thursday**

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| 8:30 a.m. - 9:00 a.m. | Networking/Coffee  
Exhibit Area |
| 9:00 a.m. - 10:00 a.m. | Keynote: Stene Charmer  
Thermal Management for Future Powertrains  
Exhibit Area |
| 10:00 a.m. - 10:30 a.m. | Networking Break  
Exhibit Area |
| 10:30 a.m. - 12:30 p.m. | Technical Sessions |
| Conference Concludes |

### Technical Sessions

**EVENT-AT-A-GLANCE**

**EXHIBIT HOURS**
Open During Show Hours on  
Tuesday, Wednesday & Thursday

**REGISTRATION HOURS**

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<th>Day</th>
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<td>Tuesday</td>
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<td>Wednesday</td>
<td>8:00 a.m.-6:00 p.m.</td>
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<tr>
<td>Thursday</td>
<td>8:00 a.m.-10:00 a.m.</td>
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**KEYNOTE SPEAKERS**

**Tuesday, October 15**

Grande Ballroom
9:00 a.m.-10:00 a.m.

Radu Theyyunni, General Motors LLC

Radu Theyyunni is the Global Director, Virtual Powertrain & Electrification within the Virtual Design, Development and Validation organization for General Motors. Radu has 31 years of CAE experience and has held several positions of increasing responsibilities within General Motors, including Lead Analysis Engineer, Engineering Group Manager – CFD Analysis and Sr Manager Engine Analysis & Design. He is also recipient of a Boss Kettering award for Math Based Calibration analysis and holds several tool methods to his credit. Radu has a MSME from Wayne State University.

**Wednesday, October 16**

Grande Ballroom
9:00 a.m.-10:00 a.m.

Ted Miller, Ford Motor Company

Ted Miller is Ford Motor Company’s Manager of Electrification Subsystems and Power Supply Research. He is responsible for Ford global electrification subsystem and power supply research. His team delivers battery system design innovations, including advanced cell technology, packaging, thermal, EDS, EMC, charging, power conversion, energy management and modeling. They provide subject matter expertise from raw materials to end-of-life recycling and second use. The team also leads collaboration in energy storage research with university, industrial, and National Lab partners. Mr. Miller is Chairman of the United States Advanced Battery Consortium Management Committee, as well as a member of several strategic and external advisory boards, including Idaho National Lab, the University of Michigan Energy Institute, Cobalt 27, and the Energy Frontier Research Center for Sodium Based Energy Storage.

**Thursday, October 17**

Grande Ballroom
9:00 a.m.-10:00 a.m.

Stene Charmer, University of Warwick

Stene Charmer leads a number of exciting battery cell research programs at WMG’s Energy Innovation Centre based at the University of Warwick campus. His team are supporting WMG’s research partners in a number of areas, namely high power lithium ion storage devices, solid state energy devices (polymer and ceramic) and novel (module level and pack level) thermal management concepts. That team works alongside WMG’s battery chemistry team, providing first hand automotive design and development expertise directly into cell prototyping development programs at WMG.

Stene has held a number of senior positions within OEM’s and tier one suppliers, with a key focus on developing and implementing novel CAE and test methods to the development of thermal management systems for passenger, commercial and military vehicles. Having worked and consulted for automotive businesses throughout main land Europe, North America, South Korea and India, he has developed a global understanding of the automotive business over the past 22 years.
<table>
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<tr>
<th>Time</th>
<th>Title</th>
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</table>
| 9:00 a.m.  | **Keynote Speaker**  
Radu Theyyunni, General Motors - The Role of CAE in Vehicle Thermal Management |
| 10 a.m.–10:30 a.m. | **Break**                              |
| 10:30 a.m. | **Moderator:**  
Bashar AbdulNour, Wayne State University  
**Panelists:**  
Brian Daugherty, Motor and Equipment Mfrs Association; Christina Motilal, US Environmental Protection Agency; Angelo Patti, Ford Motor Co.; Kenneth Porrert, General Motors LLC; Tao Zhan, California Air Resources Board |
| 12:00 p.m.–1:30 p.m. | **Waste Heat Recovery** |
| 1:30 p.m.  | **Phase Change Cooling and Waste Heat Recovery - A Combination of Technologies for High Efficiency Powertrains**  
Stephen Rolfe, IAV Automotive Engineering Inc |
| 2:00 p.m.  | **Compact Exhaust Heat Recovery System using SiC Heat Exchanger**  
Tatsuo Kawaguchi, Makoto Yoshihara, Daisuke Kimura, Yutaro Fumoto, Suheki Kuno, Takeshi Sakuma, NGK Insulators, Ltd.; Atsushi Kaneda, NGK Automotive Ceramics USA, Inc. |
| 2:30 p.m.  | **Waste Heat Recovery of Diesel Engine System using Thermoelectric Module**  
Keisuke Yokota, Waseda University; Tsutomu Iida, Tokyo University of Science; Takahide Motegi, Jin Kusaka, Yasuhiro Daisho, Waseda University; Ryu Inoue, Yasuo Kogo, Tokyo University of Science; Hirofumi Tsuchida, Nissan Motor Co Ltd; Yasuhiro Izumi, Honda R&D Co Ltd; Kei Yoshimura, Suzuki Motor Corporation |
| 3:00 p.m.  | **Energy Demand Reduction through a Heat Recovery Ventilation Module for an Electric Truck Cabin**  
Daniele Basciotti, Imre Gellai, Dragan Simic, Austrian Institute Of Technology |
| 3:30 p.m.–4:00 p.m. | **Break**                              |
| 4:00 p.m.  | **Development and Utilization of 1D Thermal Management Simulation Model in Automatic Transmission**  
Yosuke Wakamatsu, Masashi Nomura, Aisin AW Co., Ltd.; Christophe Marboutin, Siemens PLM Software; Nicolas Sabatier, Siemens Industry Software; Victor Etique, Siemens PLM Software |
| 4:30 p.m.  | **An Efficient Methodology for the Simulation of Engine Soak**  
Balázs Vehovszky, Daniel Feszy, Krisztian Király, Kolos Pintér, Szechenyi Istvan Univ |
| 5:00 p.m.  | **Holistic Approach for VTMS Analysis/Modeling using AVL CRUISE™ M**  
Waldemar Linare, AVL Powertrain Engineering Inc.; Alessandro Colla, AVL List GmbH |
| 5:30 p.m.  | **Parametric Optimization on Whole Vehicle Level for Vehicle Thermal Management Based on DoE Sensitivity Fields and Surface Morphing**  
Micha Schulz, Karlsruhe Institute Of Technology; Thomas Binner, Heinrich Reister, Daimler AG; Albert Albers, Karlsruhe Institute Of Technology |
| 6:00 p.m.  | **Using Simulation for Comparing the Predicted Annual Energy Consumption of Different Cooling System Architectures**  
Christian Rathberger, Magna Powertrain; Albert Tuertscher, AT Engineering LLC |
<p>| 6:30 p.m.–7:30 p.m. | <strong>Networking Reception</strong> |</p>
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<tr>
<th>Time</th>
<th>Session</th>
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<tbody>
<tr>
<td>12:00 p.m.–1:30 p.m.</td>
<td>Lunch</td>
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</table>
| 1:30 p.m. | Use of Partial Recirculation to Limit Build-up of Cabin Carbon Dioxide Concentrations to Safe Limits  
Gursaran Mathur, Calsonic Kansei North America Inc. |
| 2:00 p.m. | HEPA Filtration and Cabin Air Quality  
Robert Holmgren, Saru Dawar PhD, Freudenberg Filtration Technologies LP |
| 2:30 p.m. | Application of the Armrest Air Purifier to Improve Cabin Air Quality  
Christopher Franzke, Florian Ullmann, Rico Daniel Huang, David Bilby, Ford Motor Co. |
| 3:00 p.m. | Enhanced IR Blocking and the Impact on Battery Consumption and Occupant Comfort  
Kazuhiro Tomura, Dylan Carty, Libby Holt, Sekisui S-LEC America LLC |
| 3:30 p.m.–4:00 p.m. | Break                                                                                     |
| 4:00 p.m. | Microclimate Comfort System: Solution for Increasing Driving Range of Electric Vehicles  
Todd Gordon, General Motors LLC; Vikrant Varandani, Ankit Tiwari, Vladimir Jovovic, Gentherm Incorporated; Jeff Arsenault, Gentherm Incorporated; Jeffrey Bozeman, General Motors LLC; Gene Dudash, General Motors Vehicle Engineering Cntr. |
| 4:30 p.m. | EV Cooldown Study with Conductive Thermoelectric Seat Cooling  
Jonathan Kroc, Don Dutton, Tempronics Inc. |
| 5:00 p.m. | Active Control of the Direction of Ventilation Based on Monitoring of Cabin Thermal Comfort using Infrared Sensor  
Jeonghoon Lee, Joongjae Kim, Hanon Systems; DongHo Kwon, Geeyoung Shin, Hyundai Motor Co; SungJe Lee, Hanon Systems |
| 5:30 p.m. | Bridging the Gap between System Logic, Requirements and Cabin Comfort Design Validation Leveraging Model-Based Systems Engineering  
Chin-Wei Chang, Adrien Mann, Saulius Pavalkis, Edward Tate, Vijaisri Nagarajan, Dassault Systemes |
| 6:30 p.m.–7:30 p.m. | Networking Reception                                                                       |
# AGENDA

**Wednesday, October 16**

<table>
<thead>
<tr>
<th>Time</th>
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</table>
| 9:00 a.m. | **Keynote Speaker**  
*Ted Miller, Ford Motor Company - Advanced Battery Systems - The Key to Vehicle Electrification* |
| 10:00 a.m.–10:30 a.m. | **Break** |
| 10:30 a.m. | **Thermal Systems for Hybrid and Electric Vehicles: Part 1**  
(Session Code: TMSS100)  
Organizers: Bashar AbdulNour, Wayne State University; Alaa El-Sharkawy, Fiat Chrysler Automobiles; James Gebbie, Ford Motor Company; Christophe Petitjean, Valeo Thermal Systems; Andrew Sutherland, TI Automotive |
| 10:30 a.m. | **Alternative Refrigeration Systems for Electric Vehicle Battery Cooling**  
Johannes Hübel, Daimler AG; Juergen Koehler, University Of Braunschweig; Jan Gärtner, Daimler AG |
| 11:00 a.m. | **New Concept for Battery Thermal**  
Yasumitsu Omi, Takeshi Yoshinori, Koji Miura, DENSO Corporation; Matsumoto TakaFumi, Soken Inc. |
| 11:30 a.m.–1:30 p.m. | **Lunch** |
| 1:30 p.m. | **Higher Cruising Range through Smart Thermal Management in Electrified Vehicles â€“ Interaction between Air Conditioning and Cooling System Components in the Overall Network**  
Sebastian Knoll, IAV Automotive Engineering Inc.; Ronny Kurt Mehnert, IAV GmbH |
| 2:00 p.m. | **Drop-in Test of 3 Refrigerants(R1234yf, R152a, R290) for Secondary Loop Heat Pump System**  
Haejun Lee, Inguk Hwang, Hanon Systems; Jae Yeon Kim, Manju Oh, Hyundai Motor Co. |
| 2:30 p.m. | **Development of Integrated Smart Chiller Module for Electric Vehicle Battery and Electric Components Cooling**  
Rongrong Zhang, Sanhua Holding Group; Harry Eustice, Sanhua Automotive |
| 3:30 p.m.–4:00 p.m. | **Break** |
| 4:00 p.m. | **OEM/Tier 1 Panel**  
(Session Code: TMSS101)  
Moderator: Sudhi Uppuluri, Computational Sciences Experts Group  
Panelists: Robert Brinker, Denso; Hu Lu, Sanhua Automotive USA Inc.; Ted Miller, Ford Motor Company; Cedric Rouaud, Ricardo UK, Ltd.; Jeff Schlautman, General Motors LLC |
<table>
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<tr>
<th>Time</th>
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<tbody>
<tr>
<td>10:00 a.m.</td>
<td>Break</td>
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<tr>
<td>10:30 a.m.</td>
<td>Autonomous and Connected Vehicle Thermal Management</td>
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<td>(Session Code: TMSS1000)</td>
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<td>Organizers - Edward Gerges, Dana-Long Manufacturing; Wilko Jansen, Jaguar &amp; Land Rover; Sowmyalatha Jayaraman, General Motors; Vamshi Korivi, CCDC Ground Vehicle Systems Center</td>
</tr>
<tr>
<td>10:30 a.m.</td>
<td>Integrated HVAC and Powertrain Control for a Connected Plug-in Hybrid Electric Vehicle</td>
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<td>Sadra Hemmati, Nehal Doshi, Michigan Technological Univ.; Drew Hanover, Pratt &amp; Miller Engineering; Christopher Morgan, Michigan Technological Univ</td>
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<tr>
<td>11:00 a.m.</td>
<td>Integrated Active and Passive Thermal Management in Aluminium Battery Enclosures for Electric Vehicles</td>
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<td>Mathias Schmitz, Constellium</td>
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<td>11:30 a.m.</td>
<td>Lunch</td>
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<tr>
<td>1:30 p.m.</td>
<td>Simulation of Heat Exchangers with Phase Change Material</td>
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<td>Yanping Xia, Mahle; Edward Wolfe, Mahle Behr Troy Inc; Timothy Craig, Mahle</td>
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<tr>
<td>2:00 p.m.</td>
<td>Heat Exchanger Manufacturing using TRILLIUM® Lean</td>
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<td>Stefan Wass, Gränges Sweden AB</td>
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<tr>
<td>2:30 p.m.</td>
<td>Considering the Influence of Individual Variability on Thermal Comfort in a Transient Cooldown Scenario</td>
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<td>Mark Hepokoski, Timothy Scott Viola, ThermoAnalytics Inc.; Allen Curran, ThermoAnalytics Inc; Niklas Andreas Lindedal, Ronnie Hansson, Sam Gullman, Volvo Car Corporation</td>
</tr>
<tr>
<td>3:00 p.m.</td>
<td>Integrating Fast-Running Detailed Passenger Cabin Models in System Simulation to Evaluate Passenger Comfort and Range</td>
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<td>Marek Lehocky, Shawn Harnish, Gamma Technologies LLC</td>
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<tr>
<td>3:30 p.m.</td>
<td>Break</td>
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**AGENDA continued**

Wednesday, October 16

Judea Room

**Thermal Management Systems**
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</table>
| **9:00 a.m.** | **Keynote Speaker**  
Stene Charmer, University of Warwick - Thermal Management for Future Powertrains |

10:00 a.m.–10:30 a.m. Break

**Thermal Systems for Hybrid and Electric Vehicles: Part 2**

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<tr>
<th>Time</th>
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</table>
| **10:30 a.m.** | **Accurate 3D Model of Battery Module with Thermal Management**  
Aditya Velivelli, Seres; Saeed Khaleghi Rahimian, Seres |
| **11:00 a.m.** | **Integrated Thermal Management (ITS) to increase EV Drive Range**  
Sourav Chowdhury, Mahle Behr Troy Inc.; Lindsey Leitzel, Mark Zima, Mark Santacesaria, Mahle Behr Troy Inc; Joseph Voytovich, Mahle Behr Troy Inc.; Timothy Craig, Mahle; Aamir Khawaja, Murali Govindarajulu, FCA US LLC |
| **11:30 a.m.** | **A Feasibility Study into the Performance Potential of Plastic Additive Manufacture Heat Exchangers**  
Noah J. McKay, D2H Engineering Inc. |
| **12:00 p.m.** | **Battery Thermal Management Systems Development and Vehicle Integration for Conventional and Ultra-fast Charging Capabilities**  
Cedric Rouaud, Ricardo UK, Ltd. |
## Agenda Continued

**Thursday, October 17**

**10:00 a.m.–10:30 a.m. Break**

### Powertrain Thermal Systems and Energy Management

(Session Code: TMSS300)

**Organizers** - Gursaran Mathur, Marelli; Ronald Semel, Ford Motor Company; Timo Kuthada, FKFS; Alaa Elsharkawy, FCA US LLC; Andrew Sutherland, TI Automotive; Sowmyalatha Jayaraman, General Motors; Leonid Tartakovsky, Technion Israel Inst. of Technology

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<th>Time</th>
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<tr>
<td>10:30 a.m.</td>
<td><strong>1D Thermal Model and Measurements to Estimate HVAC-Modules Energy Consumption of an Electric Truck Cabin</strong></td>
</tr>
<tr>
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<td>Imre Gellai, Daniele Basciotti, Dragan Simic, Austrian Institute Of Technology</td>
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**EXHIBIT FLOOR PLAN**

- **Garden Gallery**
- **ENTRANCE**
- **ENTRANCE**

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**October 29–31, 2019 | Novi, MI**

**Featured Keynotes From:**

[Image of company logos and text]
EXHIBITOR PROFILE

Accurate Technologies Inc. (ATI) is a supplier of measurement, calibration and diagnostics hardware and software tools. With clients including global automotive OEMs and Tier Ones, ATI’s product range includes VISION Calibration and Data Acquisition software, EMX data acquisition modules and CANary FD – a compact, rugged four channel CAN FD interface.

AVL is the world’s largest independent company for development, simulation and testing technology of powertrains for passenger cars, trucks and large engines. One of AVL’s business areas is Advanced Simulation Technologies, which develops simulation software focusing on design and optimization of powertrain systems covering all phases of the development process.

Gamma Technologies LLC develops GT-SUITE, a leading multi-physics CAE system simulation software. GT-SUITE includes a library of physics-based templates covering fluid flow, thermal systems, mechanics, electrics, magnetics, chemistry, and controls. GT also develops and supports GT-AutoLion, the leading Li-ion battery simulation software for 1-D and 3-D battery analysis and design.

Gentherm is the global market leader and developer of thermal management technologies for heating and cooling and temperature-controlled applications. Its products provide solutions for automotive passenger comfort, battery thermal management, patient temperature management, and electronics. Gentherm’s automotive products can be found on the vehicles of nearly all major automotive manufacturers.

GKN Sinter Metals is the world’s leading supplier of precision metal powder components. We design and produce custom metal shape solutions with advanced engineering expertise for products in automotive and industrial applications. Our thermal management expertise supports suppliers in creating simplified designs with high thermal conductivity at a lower cost.

IPETRONIK, Inc. is an expert for data acquisition equipment, data loggers and test benches for HVAC compressor and system testing. The product range includes test benches for 1234yf, 134a, R744 and CO2. Test benches and testing services, including acoustics, are available for belt driven and electric compressors and full systems.

Magna Powertrain - Engineering Center Steyr provides automotive CAE software and engineering services. Product: KULI Thermal Management Software is used by OEMs and suppliers for: - initial cooling system layout - coupled 1D-3D simulation - cooling system fine tuning - cabin cool down - EV range prediction and many other thermal management tasks.

Seoul Industry Engineering Co., Ltd.(SIE) of South Korea offers a turbocharger test system, HX & A/C system calorimeter, System test bench, Air flow tester and state-of-the-art portable air flowmeter. SIE is well equipped to fulfill your testing requirement with its own technology.
EXHIBITOR PROFILE

SHIN-ETSU SILICONES  
1150 Damar Dr  
Akron, OH  44305  
United States  
shinetsusilicones.com  
Shin-Etsu Silicones is a leading global manufacturer of silicone materials for the electronics industry. Shin-Etsu’s products protect sensitive electronics from damaging environments and insures the reliable, long-lasting performance of your components. Our products include adhesives sealants, potting encapsulants, conformal coatings, thermal interface materials, and SIFEL elastomers for extremely corrosive environments.

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Ankeny, IA  500219412  
United States  
spalusa.com  
SPAL manufacturers DC axial cooling fans and centrifugal blowers with an emphasis on sealed brushless motor technology for the global OEM market. SPAL provides value for the automotive, truck, bus, off-highway, stationary, ATV, military and other markets including EV, Hybrid and Battery cooling applications, providing the highest quality products available.

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