

SAENIS TTTMS Thermal Management Systems Conference-2020

SAEINDIA Northern India Section (SAENIS) organized the thermal management systems conference-2020 on the theme, "Future Thermal Systems - New Possibilities". It was a four days event held from **26th to 29th August 2020** in web conference format. This was the first time SAENIS conducted the conference in online mode and that too with huge success. The event was well supported and appreciated by industry & academia experts as well as various other organizations. The event was sponsored by Gamma Technologies, Subros Limited, BP Refcool, Pranav Vikas India Pvt. Ltd., Maruti Suzuki India Limited, Tata Motors Limited, Honda Cars India Limited & ICAT along with the administrative support from corporate volunteers and SAE Members.

The conference covered the following topics in the thermal management systems domain in two different categories.

Category A: Future Policy Requirements

- Real Drive Emissions
- Corporate Average Fuel Economy
- India Cooling Action Plan
- Faster Adoption & Manufacturing of Hybrid & Electric Vehicles

Category B: Current & New Technology Trends

- Thermal Systems for Electric & Hybrid Vehicles
- Thermal Simulation/Modeling, Testing & Validation
- Vehicle Climate Control
- Alternate Heating & Cooling Concepts

Apart from that event also provided the platform to include other thermal management topics such as automotive power-train cooling, vehicle under-hood thermal management, human factors including thermal comfort and cabin air quality, alternative refrigerants, thermal systems & components, thermal systems for hybrid & electric vehicles, thermal systems for heavy and off-road vehicles, and waste heat recovery.

The summary of the presentations covered during the session is as follows:

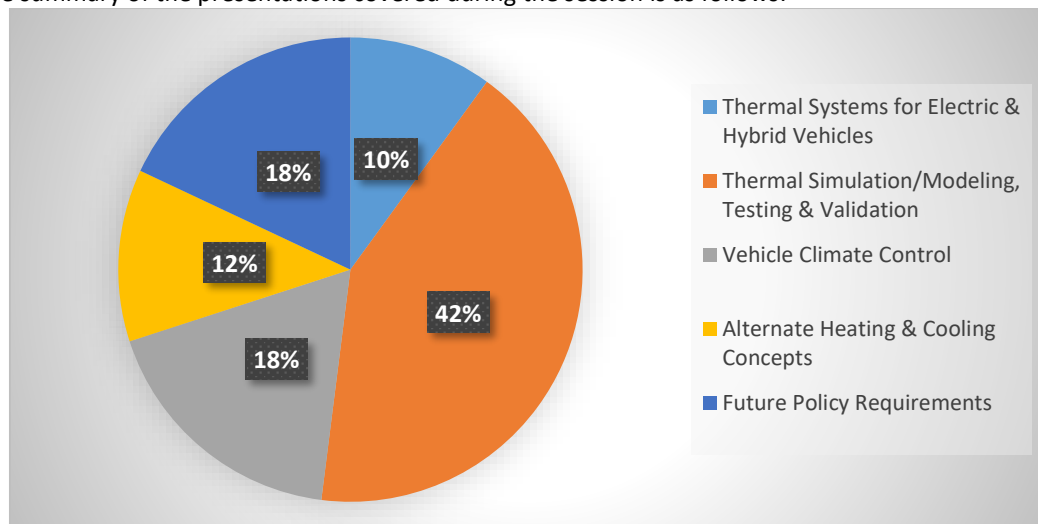


Figure: Presentation Summary in SAENIS TTTMS Thermal Management Systems Conference -2020

The key glimpses and highlights from the inaugural session as well as key note presentations

- ❖ The web conference was inaugurated by **Chief Guest Mr. Balraj Bhanot** (Management Consultant, Chairman TEDC (BIS)), who highlighted the challenges and future requirements in HVAC and engine cooling systems. He also emphasized the need of energy & cost-efficient environment friendly thermal management systems in passengers as well as commercial vehicles.

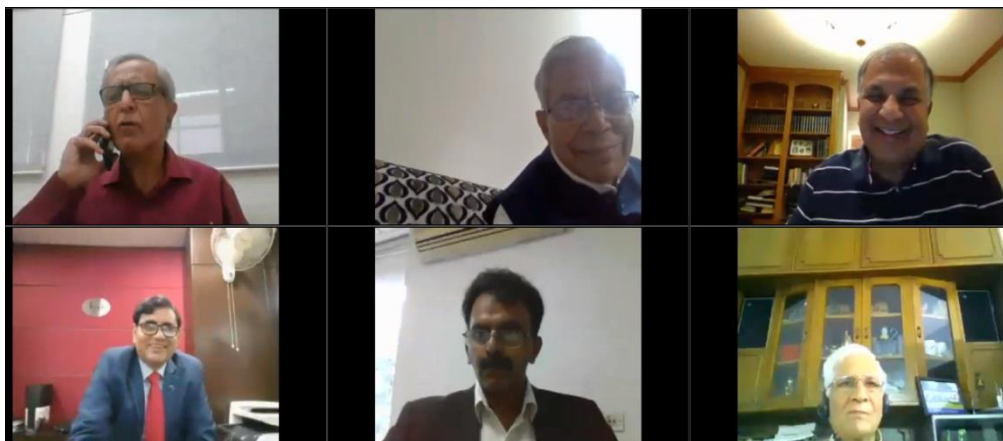


Figure: Inaugural Session by Chief Guest & Invited Keynote Speakers

- ❖ The opening session was addressed by **Mr. Anup Kacker (Executive Director, SAENIS)**, who highlighted the importance and need of the Future Thermal Systems Technologies under the forum “Think Tank for Thermal Management Systems”. Furthermore, Mr. Anup emphasizes the idea of using such common platforms to discuss & resolve the several problems related to thermal management systems by the industries & academia experts.
- ❖ The keynote speakers **Mr. Srini Dampur (Executive Vice President, Subros Ltd.)** & **Mr. Dinesh Tyagi (Director, ICAT)** highlighted the technological challenges faced by the industry & contribution of such forum to help the industries in solving them. They also provided the motivation to take this event to the international level in subsequent chapter to cover the global issues through this.
- ❖ The session was followed by the theme speakers **Mr. Sandeep Raina (Senior Vice President, Engineering, Maruti Suzuki India Limited)**, **Dr. Prasad Kadle (Fellow SAE, Fellow ASME)** & **Mr. S.H. Kapoor (General Manager, ERC, Tata Motors Ltd.)** who provided the glimpse of future thermal systems requirement and available technologies. The talk was followed by panel discussion, which was quite useful to evolve the technology road-map for future thermal systems development.
- ❖ The event was subsequently followed by a panel discussion on “**India Cooling Action Plan - Technology Upgradation**”. The panelists were **Dr. R.S. Agrawal (Senior Advisor, Ozone Cell, India)**, **Dr. Satish Kumar (President & Executive Director, AEEE)**, **Mr. S.H. Kapoor (GM, ERC, Tata Motors Ltd.)**, **Mr. Yuji Yamamoto (CTO, Pranav Vikas India Ltd.)**, **Dr. Siva Sankar Murugan (Lead Engineer, M&M)** & **Mr. Kapil Singhal (Managing Director, B P Refcool)**. The panel discussion was moderated by **Mr. Yogendra Singh Kushwah (DGM, Subros Technical Centre)**. The discussion comprises of thermal management systems technology upgradation to meet the future targets of HVAC’s global warming potential reduction and energy efficiency norms along with the discussion on policy and technology up gradation. The panel emphasized that collaborative work can really help the industry to formulate the right strategy to achieve futuristic policy targets. Also, the concerns regarding star rating of automotive AC were clarified. It was said that SAE can play an active role for the execution of India Cooling Action Plan.

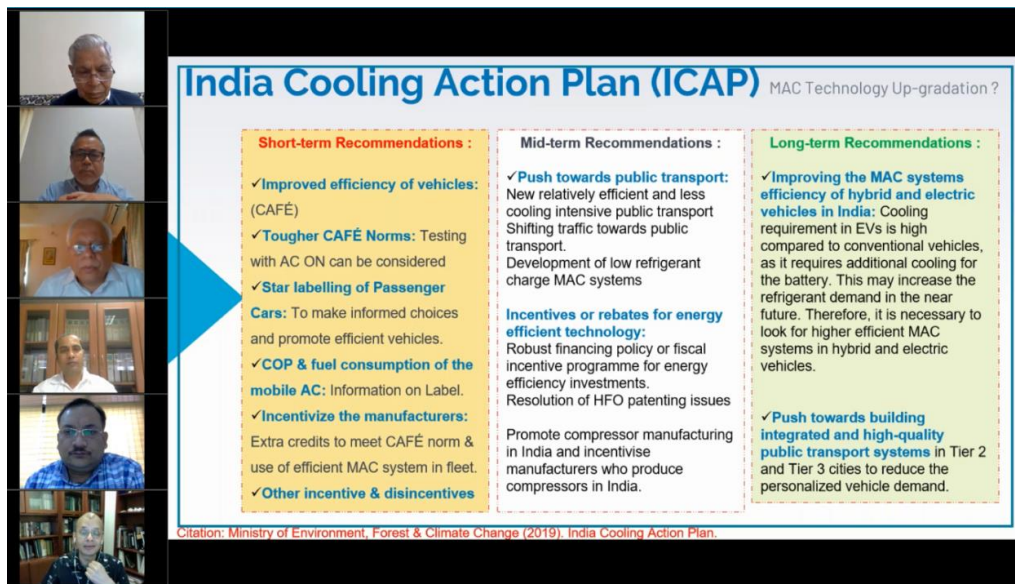


Figure: Panel Discussion on India Cooling Action Plan - Technology Upgradation

The key highlights from the session future policy requirements from the invited speakers

This session covered the wide range of topics in thermal management systems design & development which are crucial for the futuristic policy making.

- ❖ The technical sessions on **Real Drive Emission (RDE)** were taken by **Mrs. Pamela Tikku (Chief Business Officer, NATRIP, ICAT) & Mr. Simon Williams (RDE Operations Leader, MAHLE Powertrain Limited)**, who highlighted the need, opportunities & challenges to establish RDE norms across the globe specially in India, Europe, Japan, China, Korea, United States. They also talked about the evolution of RDE across the globe in different time phases, RDE packages and differentiation among RDE norms based on geographical differences.



Figure: Keynote Speaking Session on IRDE by Mrs. Pamela Tikku

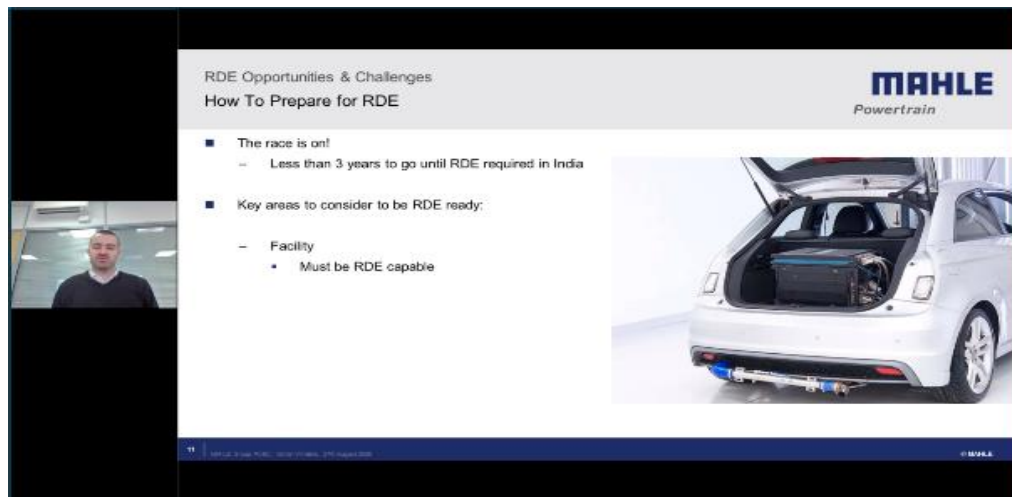


Figure: Keynote Speaking Session on IRDE by Mr. Simon Williams

- ❖ The technical session on **Faster Adoption & Manufacturing of Hybrid & Electric Vehicles – Future Roadmap** were taken by panel of invited speakers including **Mr. Martin Murray (Chief Technology Officer, Mahindra Electric Mobility Limited)**, **Dr. Tapan Sahoo (Executive Vice President (Maruti Suzuki India Limited))**, **Mr. Ramnik Singh (Head India Operations, Gamma Technologies)** & **Mr. K. Srinivas (Executive Director, Pranav Vikas & Group)**.



Figure: Keynote Speaking Session on FAME by Dr. Tapan Sahoo (Top Left), Mr. K. Srinivas (Top Right), Mr. Martin Murray (Bottom Left) & Mr. Ramnik Singh (Bottom Right).

- ❖ **Dr. Tapan Sahoo (Executive Vice President (Maruti Suzuki India Limited))** delivered the keynote session on FAME, who highlighted the need and drivers of electrification in India for developing electric vehicles (EVs) market, range of electrification technologies for electric vehicles, future market penetration of EVs in India & challenges to that.
- ❖ **Mr. Martin Murray (Chief Technology Officer, Mahindra Electric Mobility Limited)** highlighted the key contribution of electronics & power electronics components in EVs, e-Motor thermal management systems, battery thermal management systems & future trends of such technologies across the globe.
- ❖ **Mr. K. Srinivas (Executive Director, Pranav Vikas & Group)** emphasized on the electric vehicle products and systems, which included traction cooling system, battery cooling system, integrated battery pack and cabin cooling system, along with integrated cooling and heating system for EVs.

- ❖ **Mr. Ramnik Singh (Head India Operations, Gamma Technologies)** talked about the need and challenges of FAME 2.0 and its compatibility with the automobile ecosystems. Also, he extensively covered the uses of simulation software “GTSuite” with the new technologies.
- ❖ The technical sessions on **Corporate Average Fuel Economy** were taken by the invited speakers **Mr. Rajendra Khile (General Manager, Renault Nissan Technology and Business Center)**, **Mr. Anoop Bhat (Sr. Vice President, Head Powertrain Development, Maruti Suzuki India Limited)** & **Mr. Yash Pal Sachar (Vice President, Honda Cars India Limited)**.
 - ❖ **Mr. Rajendra Khile (General Manager, Renault Nissan Technology and Business Center)** highlighted the regulatory drivers of CAFÉ norms, India regulation requirements, global perspective of CAFÉ norms & CAFÉ reporting timelines for OEMs and related organizations.
 - ❖ **Mr. Anoop Bhat (Sr. Vice President, Head Powertrain Development, Maruti Suzuki India Limited)** emphasized on the CAFÉ regulation in India & its comparison with European Union and Japan norms, technology development to improve fuel consumption & challenges to improve CAFÉ.
 - ❖ **Mr. Yash Pal Sachar (Vice President, Honda Cars India Limited)** highlighted the trending scenario of de-dieselization across the globe, especially in Europe. He also emphasized the importance of diesel engine technology, its challenges and opportunities in vehicle manufacturing for OEMs in terms of new technologies and emission norms.

The Major Highlights of the presentations on “Current and New Technology Trends”

- ❖ **Technical Session on Thermal Systems for Electric & Hybrid Vehicles:**
 - This session extensively covered the topics such as battery thermal simulation methods for EVs, experimental performance study of electric reefer systems for commercial electric vehicle, climate control strategy for EVs, universal thermal management systems, performance characteristics for EVs. This session was delivered by the respective professional experts from Subros Ltd, Tata Motors Ltd. & Pranav Vikas India Ltd.
- ❖ **Technical Session on Thermal Simulation/Modelling, Testing & Validation:**
 - This session covered the in-depth analysis of simulation software/tools used in different automobile thermal management systems to evaluate the performance & desired requirements.
 - The topic Early Refrigerant Gas Leak Detection in MACs was covered by expert from B P Refcool.
 - The topic Thermal management of electrified vehicle by means of system simulation was covered by speaker from Gamma Technologies.
 - Thermal Analysis of Clutch Assembly Using Co-Simulation Approach was covered by Mahindra Research Valley & Effect of Variable Geometry Fin in Automotive Condenser using Analytical and CFD Approach was covered by speaker from Mahindra & Mahindra Ltd.
 - Performance improvement of Rail AC assembly by using CAE and CFD analysis, Iterative study to improve Air flow distribution on ventilation unit duct using CFD analysis, Dynamic behavior of in-cylinder pressure causing fatigue failure of reed valves, Parametric Analysis of Impact of Geometrical Parameters on Thermal Performance in Compact Heat Exchangers, Adaptation of Sub-cool Condenser for An Air Conditioning System Employing An Internal Heat Exchanger & Design and development of a condenser for an Air-conditioning systems working in very high ambient temperature and dusty external environment were covered by speakers from Subros Ltd.

- Transient hot shut down, CFD simulation technique for Under hood thermal management, Cabin and Battery Cooling Performance Trade-off in an Electric Vehicle were covered by Tata technologies Ltd. and High Voltage Battery durability enhancement in electric mobility through 1D CAE were covered by speakers from Tata Motors Ltd.
- Numerical Investigations on Heat Transfer and Flow Characteristics of Climate Control Systems in Electric Buses was covered by speakers from Pranav Vikas India Limited.
- CFD investigation of exhaust gas bypass on truck trolley heating was covered by speaker from John Deere India Private, Ltd.
- Advanced Methods to handle LSPI in TGD engines was covered by speaker from Vellore Inst. of Technology, Vellore.
- Assessment of Engine cooling system Performance using 1-D/3-D simulation approach for Engine transient Cycle was covered by speaker from TAFE Motors and Tractor Limited.
- Simulation Methodology for design and development of Li-ion Cell and Battery Pack was covered by speaker from ICAT.
- A review on numerical simulation methods for lithium-ion battery thermal management system based on phase change material and heat pipes was covered by speaker from Assam Engineering College.
- Aero-thermal analysis of ventilated passage in a brake disc was covered by speaker from Veermata Jijabai Technological Institute.

❖ **Technical Session on Vehicle Climate Control:**

- Application of Phase Change Materials (PCM) for reducing cabin heat load, Methodology to quantify the undesirable effects of the localized inefficiency of heat pick-up in suction line on an automotive air-conditioning system, Experimental analysis of AC compressor induced noises in Automobiles, A detailed study of prominent factors affecting evaporator frosting in a mobile air conditioning (MAC) system and Challenges to incorporate cabin air quality enhancer in mobility solutions were presented by Tata Motors Ltd.
- Refrigerant Valves in AC- and Heat Pump systems for Electric Vehicles was presented by Otto Egelhof GmbH & Co.
- Innovative Rear Air Blower Design Application for Improving Cabin Thermal Comfort with improved Air Distribution and Air Quality was presented by Subros Ltd.

❖ **Technical Session on Alternate Heating and Cooling Concepts:**

- Simulation of the performance of solar driven thermoelectric based rotary desiccant wheel HVAC system & Simulation of Hybrid Packed Desiccant beds for De-humidification and Drying were presented by speakers from Vellore Inst. of Technology.
- Thermal management of different systems using thermochemical energy storage, phase change materials and nano-particles was presented by expert from IIT Bombay.
- UDM Tip Temperature Control using Thermosyphon Principle was presented by speaker from Mahindra & Mahindra Ltd.
- Experimental Investigation of Dual AC System used for Battery cooling plate was presented by speaker from Subros Ltd.
- CVT cooling using a passive heat exchanger was presented by speaker from Maharaja Agrasen Inst. Of Technology.

❖ **Valedictorian Ceremony**

- **Event Summary:** The four-days of this event comprise of **forty-one technical papers presentations, nine keynote presentations and one panel discussion.**
- At the end of the event, this session was addressed by the Panel of invited dignitaries from several domains of expertise including **Mr. I.V. Rao (Senior Fellow, TERI), Mr. Naveesh Garg (Executive Director & Chief Strategy Officer, Minda Group), Mr. R.K. Malhotra (Ex-Director, IOCL) & Mr. S.H. Kapoor (General Manager, ERC, Tata Motors Ltd.).** This session also felicitated the **top-3 papers** as well as **top-3 presenters** from different organizations selected by the panel of juries from the executive team members.



Figure: The Panel has Mr. Anup Kacker (Top Left), Mr. Naveesh Garg (Top Middle), Mr. S.H. Kapoor (Top Right), Mr. I.V. Rao (Bottom Left) & Mr. R.K. Malhotra (Bottom Middle)

❖ Overall Conference Insights

- For the first time, SAENIS TTTMS web conference was hosted online with huge and impactful success.
- The conference was scheduled for four continuous days and it was comprised of forty-one technical papers presentations, nine keynote sessions & one panel discussion.
- There were total of 587 participants with an average of approx. 150 participants each day (Highest: 188; Lowest: 109) with 72% average interest and 72% attentiveness.
- Total of 200 questions were asked with an average of 50 questions each day along with total of 150 polls were answered by the participants with an average of 35 participants each day.
- The overall feedback of the conference can be observed below.

