



**1. Centre of Excellence for E-mobility**

**2. Calibration of EMI/EMC Testing related Instruments under NABL**

**3. Development of Aluminium Superstructure City Bus – A Step towards Greener Environment**

**4. ARAI Efforts for Methanol Economy**

**5. ARAI's Designation as "Foreign Motor Vehicle Testing Institute" by NTSEL (National Traffic Safety and Environment Laboratory) National Agency for Automobile and Land Transport Technology, Japan**

**6. Symposium on International Automotive Technology, 2019 (SIAT 2019)**

**□ Centre of Excellence for E-mobility**

In line with National Electric Mobility Mission and thrust of Government of India on Electric Mobility, rampant growth in Electric Vehicle development is envisaged in India.

ARAI, the premier Automotive R&D, Testing and Certification Institute in India, has geared up to support the automotive industry for development, evaluation and certification of Electric Vehicles (EVs). In line with this, ARAI has set up comprehensive state-of-the-art Center of Excellence (CoE) for Electric / Hybrid Electric vehicles (2-Wheelers, 3-Wheelers, Passenger cars, Buses and Commercial vehicles) and their components such as traction batteries, motors, controllers, chargers, etc.

We believe that, considering technological advances and stringent regulatory norms, automotive designers will be compelled to move towards EVs and in particular electrification of powertrains.

This center will support Government's Electric Mobility Mission to scale up Electric Vehicles (EVs) in India and automotive vehicle and component manufacturers. We can be partner for vehicle and component manufacturers providing active help in product development and analyzing field failures along with evaluation of design, functionality and certification.

**List of Facilities under Center of Excellence for E-Mobility:**

- 100 kW DC Power Supply-cum-Battery Emulator
- 250 kW DC Power Supply-cum-Battery Emulator
- 150 kW motor test bed
- 220 kW motor test bed
- 250 kW battery pack level tester
- Battery Module Level Tester
- Battery Cell performance test system with environmental chamber
- HCV chassis dynamometer

## Facility Installed at ARAI Homologation and Technology Centre, Chakan (Near Pune, India):

### 150 kW Electric motor test bed:

It facilitates complete development, testing, verification and validation of electric drives and is useful for determining and analyzing electrical, mechanical and thermal characteristics. Tests such as functionality, reliability, endurance and cold startability are conducted under real operating conditions.



### Calibration of EMI/EMC Testing related Instruments under NABL



#### Includes Calibration of Key Parameters:

- |  |  |
|--|--|
| <ul style="list-style-type: none"><li>❖ Impedance</li><li>❖ Insertion Loss</li><li>❖ Return Loss</li><li>❖ First peak current</li><li>❖ Current at Different ns (e.g. @30 ns, 60 ns, etc.)</li><li>❖ Rise / Fall Time</li><li>❖ Air discharge DC voltage</li></ul> | <ul style="list-style-type: none"><li>❖ Pulse Amplitude</li><li>❖ Pulse Width</li><li>❖ Repetition frequency</li><li>❖ Burst duration</li><li>❖ Burst period</li><li>❖ Open circuit voltage / Short circuit current</li><li>❖ Front time</li></ul> |
|--|--|

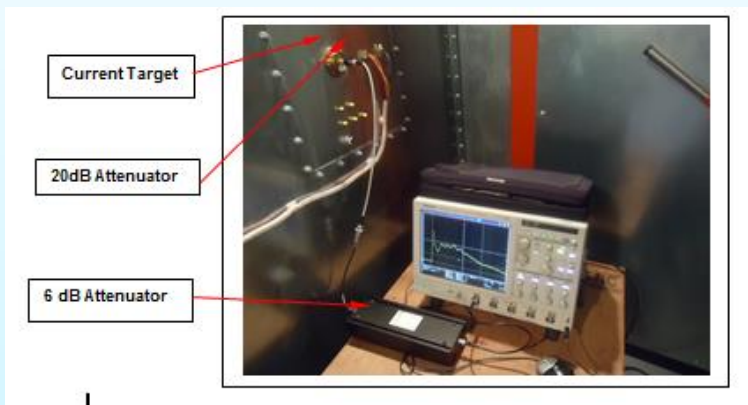


Parameter	Range	CMC
Impedance	10 KHz to 230 MHz (2.72 $\Omega$ to 200 $\Omega$ )	$\pm 7.3\%$ to $\pm 14\%$
Insertion Loss	9 KHz to 6 GHz (0.1 dB to 65 dB)	0.63 dB
Return Loss	9 KHz to 6 GHz (1.0023 to 3.5 )	$\pm 7.3\%$ to $\pm 13\%$

- Different types of Immunity Generators:



### 1. ESD Simulators Calibration:



Parameter	Range	CMC
Contact Discharge Current $I_{pk}$ and $I$ at $t_{ns}$	$\pm 2kV$ to $\pm 30 kV$ (0.15 A to 112.5A)	$\pm 4.86\%$ to $\pm 8.2\%$
Rise/fall time	0.7 to 1ns	$\pm 6.96\%$ to $\pm 7.45\%$
Air discharge DC voltage	$\pm (2-30kV)$	$\pm 2.69\%$



### 2. EFT Generators, CDN:



Parameter	Range	CMC
Amplitude	$\pm 25 V$ to $\pm 4kV$	$\pm 3\%$
Time	5 ns	$\pm 4\%$
Width	50 ns & 150 ns	$\pm 4\%$
Repetition Frequency	4 KHz to 120 KHz	$\pm 4\%$
Burst Duration	0.7 ms to 18 ms	$\pm 4\%$
Burst period	300 ms	$\pm 4\%$

### 3. Combination Surge Wave Generator, CDN :



Parameter	Range	CMC
<b>Open Circuit voltage</b>		
Voltage	$\pm 0.5 \text{ KV to } \pm 5 \text{ KV}$	$\pm 3\%$
Front/Rise Time	1.2/1 $\mu\text{s}$	$\pm 4\%$
Width	50 $\mu\text{s}$	$\pm 4\%$
<b>Short Circuit current</b>		
Current	$\pm 0.25 \text{ KA to } \pm 2 \text{ KA}$	$\pm 5\%$
Front/Rise Time	8/6.4 $\mu\text{s}$	$\pm 4\%$
Width	20/16 $\mu\text{s}$	$\pm 4\%$

### 4. Voltage Dips / Interruption Generator:



Parameter	Range	CMC
Amplitude	0-100%	$\pm 3\%$
Time	10 ms- 5 Sec	$\pm 4\%$

## 5. Voltage Drop Simulator:



Parameter	Range	CMC
Amplitude	0 to 60 V & 0 to 40 A	$\pm 1\%$ & $\pm 4\%$
Time	1 ms to 10 ms	$\pm 4\%$
Width	5 ms to 5 sec	$\pm 4\%$

## 6. Micro-Pulse Generator:



Parameter	Range	CMC
Amplitude	20 to 600 V	$\pm 3\%$
Time	1 $\mu$ s to 60 $\mu$ s	$\pm 4\%$
Width	1.75 ms to 6 ms	$\pm 4\%$

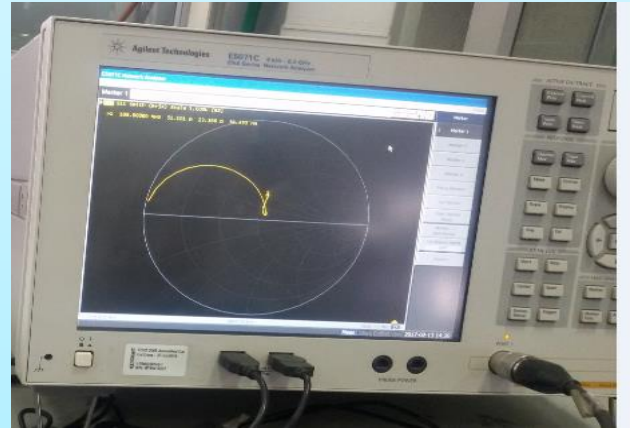
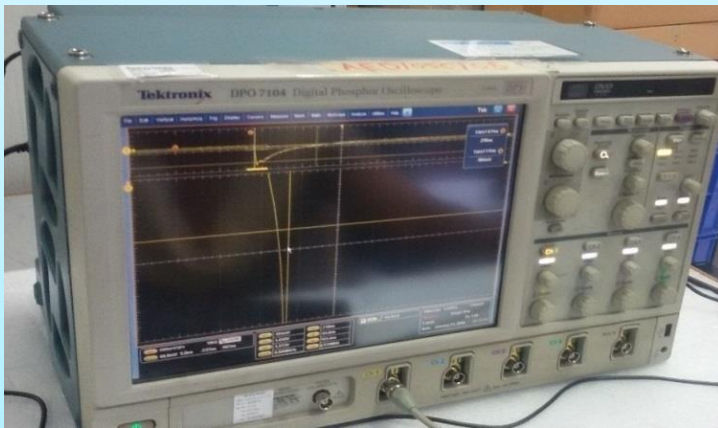
## 7. Load Dump Generator:



Parameter	Range	CMC
Amplitude	20 to 200 V	±3%
Time	5 ms to 10 ms	±4%
Width	40 ms to 400 ms	±4%

### Reference Equipment Used

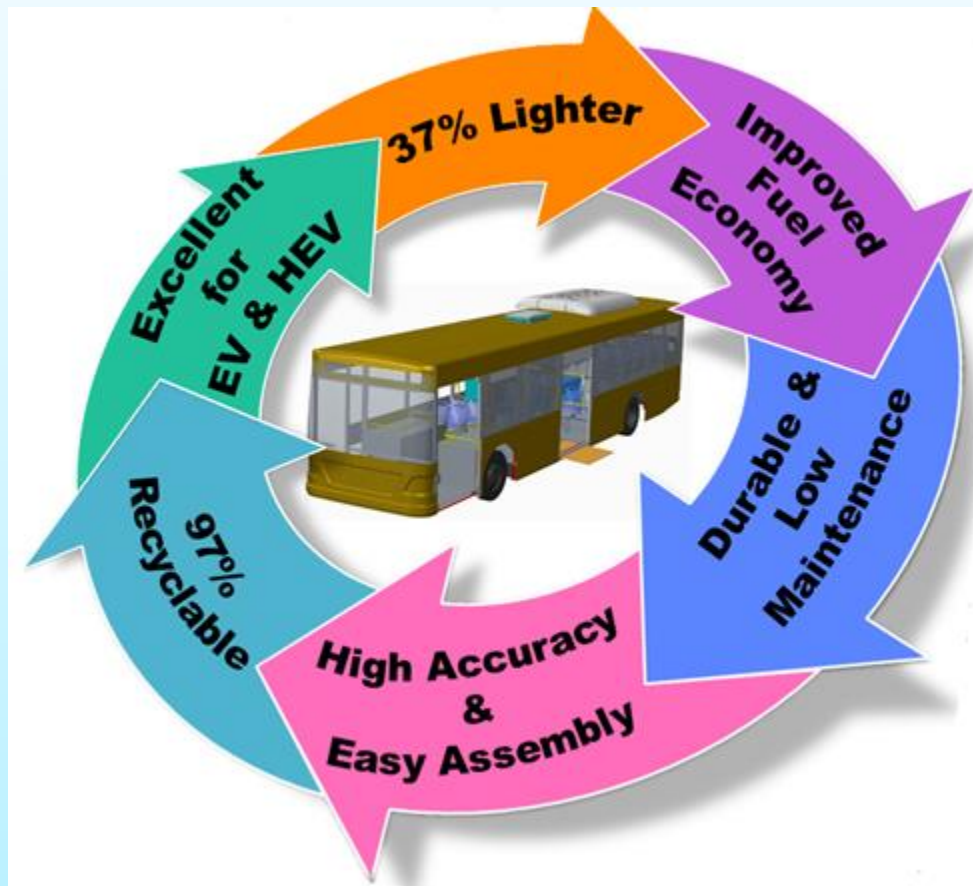
Digital Storage oscilloscope, ENA series Network Analyzer, HV Differential Probe, Current monitor probe, ESD Target Different types of respective loads and attenuators, etc.



## Development of Aluminium Super Structure City Bus – A Step towards Greener Environment

Pollution due to fossil fuel combustion is the primary concern for India and vital area to be addressed. Large population of automobiles has significant impact on climate change. Urban population is most affected due to these GHG emissions and significant number of them are getting health disorders. Even though there have been significant improvements in powertrain technology, particularly fuel efficiency, this has not been enough to neutralize the effect of increasing urban vehicular population.

In order to address above need, ARAI has designed and developed 12m, Low Entry city bus prototype with environment-friendly material, Aluminium. Bus design meets all the regulatory requirements, addressing engineering challenges of strength and durability under Indian road conditions, human comfort and fuel efficiency improvement.



Light weighting through aluminum can be directly adapted for EV and HEV to compensate increased weight due to electrification and hybridization. Lighter the structure better the battery life. Significant improvement in charging frequencies is observed with lightweight structures for Electric vehicles.

### Why City Bus?

Power required to move vehicle has direct co-relation with the mass of the vehicle. It follows that any reduction in the mass of the vehicle would mean lesser power requirement for its movement. In realistic driving situations where there are several start and stops over a certain period of time, like in case of city transit buses, quantum of benefit increases over a large number of cycles. It is thus logical to target city bus for light weighting for reduction in fuel consumption. Mass of bus has functional relationship with fuel economy and emissions, given that powertrain and drivetrain efficiency remains constant.

Looking at the city buses in India, it is found that major weight of bus is of its super structure, which is made of steel. Reduction in weight of this structure will take a step ahead towards greener environment. 1 kg aluminium used as against steel can reduce 20 kg of CO<sub>2</sub> emissions over the life of a vehicle. Aluminium can be recycled (up to 97%) and after end of vehicle life this aluminium property gives push to achieve cleaner environment along with recycling cost benefit.

### Lightweighting of bus using Aluminium - ARAI experience:

Aluminium bus design and development from concept to compliance carried out by ARAI-CAE team. Measured road load data of Indian cities was used while designing bus superstructure for city application. Virtual validation of design carried out using simulation technique. Integration of aluminium superstructure with steel chassis was carried out using mechanical fasteners. Aluminium bus body is free from welding and Heat affected zone (HAZ) is absent, this feature makes superstructure more durable.



Aluminium super structured bus prototype has following salient features:

- **37% lighter** superstructure for its class of buses
- **Improved fuel economy**
- Fully bolted bus structure design - Simple and fast assembly
- Durable for Indian road load conditions
- Meets Strength (**UBS-II**), NVH (**AIS:153**) & Bus Body Code (**AIS:052**) requirements
- Improved corrosion resistance
- **Easy adoptability for EV, HEV & CNG** bus application



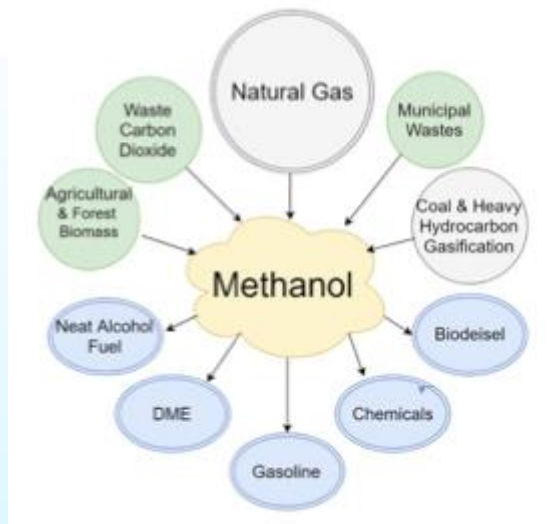
While embarking on accelerated growth of automobile, use of lighter material such as aluminium need to be increasingly used in vehicle to curb GHG emissions. Use of aluminium for public transport buses on a large scale is now feasible for addressing stringent fuel consumption regulations while maintaining structural integrity, comfort and safety.



## □ ARAI Efforts for Methanol Economy

### Background:

Methanol is a fuel, which can be derived from high ash coal or natural gas or biomass. Methanol contains less carbon and hence can be used as a fuel in SI engine vehicles.



Recently Ministry of Road Transport & Highways, Govt. of India, vide GSR 490(E), has notified M-15 and M-100 as automotive fuels. BIS is developing Indian specifications for M-15 and M-100 fuels. Further studies on methanol on locomotives, marine applications and cooking stoves are planned. A seminar was held in ARAI in April 2017 for promotion of methanol economy in India. ARAI will play an important role in field validation, vehicle trials and certification of vehicles developed as per BS-VI emission norms. Scope of the study proposed by ARAI to Department of Heavy Industry, Govt. of India, is as follows:

### SCOPE

- Evaluation of a Physico-chemical characteristics of Methanol
- Establishing effect on fuel economy and benefit of emission reduction in MPFI Engines for 15% Methanol-gasoline blend on chassis dynamometer / engine dynamometer at ARAI.
- Field trials for establishing fuel efficiency, emission reduction, compatibility and durability of engine components using Methanol.
- Engine Durability Studies for Methanol.

### PHYSICO-CHEMICAL STUDIES

For these studies, following test fuels may be used

- Neat Gasoline +15% Methanol

Oil companies have been supplying gasoline in India conforming to BIS 2796 specification. Blending of 15% Methanol will affect physico-chemical characteristics of the fuel. All the test fuels to be tested as per BIS specification for following parameters:

- |                                    |                         |
|------------------------------------|-------------------------|
| • Colour                           | • Sulphur Content       |
| • Copper Strip Corrosion           | • Existing Gum content  |
| • Density                          | • Potential Gum content |
| • Distillation                     | • Reid Vapour Pressure  |
| • Anti-knock Index / Octane number | • Vapour Lock Index     |

## Establishing Effect on Fuel Economy and CMVR Trials

Testing to be carried out using 15% Methanol blends on chassis dynamometer basis (vehicles below 3.5 tons) on IDC / WMTC Cycle, for compliance to BS-IV and BS-VI norms.



CMVR Trials to be conducted on proto vehicle (2-Wheeler & 4-Wheeler) using 15% methanol blend

- Range
- CSFC
- Driveability
- Gradeability
- EMI/EMC
- Acceleration
- Cold Startability
- Cooling Trials

## Field Trials Planned

It is necessary to conduct field trials on a fleet of 10 passenger cars with blends of 15% Methanol. The vehicles will have to be tuned by the manufacturer for operation with blends. Apart from startability and drivability tests mentioned above, the fleet of vehicles may be run daily over a fixed route of about 100 km, for total of at least up to 1,00,000 km. After every 10,000 km run, following tests will be conducted:

1. Fuel Economy as per Indian Driving Cycle (IDC) on chassis dynamometer at ARAI, at constant speeds of 40, 60 and 100 km.
2. Normal Fuel Economy tests for fleet may be conducted by topping up method.
3. At the end of the trials, vehicle engines may be inspected by for any adverse effects

## Engine Durability Studies

Durability testing for 500 hours on engine basis with 15% gasoline-methanol blend for SI Engines. Durability includes periodic FTP for 100 hours and will be followed by strip down of engine and metrology on all parts.

## Certification of upgraded METHANOL Vehicles for BS-IV and BS-VI emission norms

ARAI is capable to certify upgraded methanol M-15 vehicles against BS-IV and BS-VI emission norms. Application in standard CMVR format be submitted to ARAI for certification.

❑ **ARAI Designation as “Foreign Motor Vehicle Testing Institute” by NTSEL (National Traffic Safety and Environment Laboratory) - National Agency for Automobile and Land Transport Technology, Japan**

It is a matter of pleasure to announce that in July 2018, NTSEL (Japan) granted to ARAI (India) accreditation for test item, viz. “Japan Motorcycle Exhaust Gas Emission Test”, carried out as per TRIAS31-J044(2)-01.

**Objective**

Objective of this accreditation is to establish relationship between National Traffic Safety and Environment Laboratory (NTSEL) and The Automotive Research Association of India (ARAI) as designated Testing Institute, regarding designation of foreign motor vehicle testing institutes for utilizing ARAI test data.

**Designation**

Means a designation made by NTSEL to provide examination services, in which results of tests conducted by Testing Institute in foreign country are utilized, so that NTSEL may smoothly provide examination services Regarding type designation of vehicles manufactured in foreign country.

**Effect of Designation**

As ARAI has been designated, NTSEL may provide examination services, utilizing the results of tests conducted by ARAI regarding the test item so designated.

**Criteria for Designation**

NTSEL designated ARAI for applied test item according to enforcement procedure for “designation of Foreign Motor Vehicle Testing institutes for utilizing their data” as per NALTEC Rule No. 28 dated 1<sup>st</sup> April 2016, based on written application and accompanying document. NTSEL verified the scope of test item, in which ARAI is considered to have technical capabilities to properly provide the test services.

**On site survey by NTSEL**

NTSEL has visited the premises of ARAI and surveyed its machinery equipment and other facilities used for the test services, and the procedure for such services in order to confirm whether ARAI complies with the criteria.



*NTSEL Audit Team with ARAI officials*

## □ Symposium on International Automotive Technology (SIAT) 2019



### Brief:

Symposium on International Automotive Technology (SIAT), widely acclaimed by global automotive fraternity, is a benchmark biennial international event, organized by ARAI, that serves as a platform for exchange of ideas and brainstorming for the automotive industry, with participation of eminent experts worldwide in various automobile arenas.

Forthcoming edition of SIAT, viz. SIAT 2019, the 16<sup>th</sup> in the series, being organized by ARAI, in association with SAEIINDIA, NATRiP and SAE International (USA), at Pune (India), from **16–18 January 2019**.



Theme of SIAT 2019 is “**Empowering Mobility – The Safe & Intelligent Way**”.

SIAT 2019 will focus on recent advances in various automotive areas, such as Safety, Emissions, Engines, Noise, Electric Mobility, Electronics, Intelligent Transportation, Vehicle Dynamics, Materials, Alternate Fuels and Simulation & Modelling. It will also bring to fore innovative ideas and solutions in automotive technologies to meet future challenges.



SIAT 2019 and SIAT EXPO 2019 would be held at fresh scenic location, viz. Oxford Golf Resort – Hill Top, Mumbai-Bangalore Highway, Bavdhan, Pune 411 045, with due consideration of caliber and status of SIAT and also emphasis on ambience, central location, accessibility, ample space, etc.

### PROGRAMME:

	SIAT 2019	SIAT EXPO 2019
16 JANUARY 2019, Wed	Inaugural Function, Plenary Session & Technical Sessions	Inaugural Session & Exhibition
17 JANUARY 2019, Thu	Plenary Session & Technical Sessions	Exhibition
18 JANUARY 2019, Fri	Technical Sessions, Panel Discussion & Valedictory Function	Exhibition

## TECHNICAL PAPER PRESENTATION:

SIAT 2019 Technical Paper Presentation has received overwhelming response in terms Abstracts from various authors across the globe. Total 1,000 Abstracts received through SAE MyTechZone, of which 700 prevailed by experts for submission of draft manuscripts. Around 150 technical papers on various subjects will be presented in 30 parallel sessions in 6 halls.

List of Manuscripts received for review is given below:

Subject Code	Topic
SIAT100	Active and Passive Safety
SIAT101	Advanced Driver Assistance System (ADAS)
SIAT102	Advanced Powertrain Technology
SIAT103	Advanced Vehicle Dynamics
SIAT104	Agricultural Tractors
SIAT105	Alternative Fuels
SIAT106	Autonomous Vehicles
SIAT107	Construction Equipment Vehicles
SIAT108	Electric & Hybrid Electrical Technology
SIAT109	Emission Measurement & Control Technology
SIAT110	End of Life & Recycling
SIAT111	Harmonization of Regulations
SIAT112	Intelligent Transport Systems
SIAT113	Materials & Manufacturing
SIAT114	Noise Vibration & Harshness
SIAT115	Public Transport Systems
SIAT116	Simulation & Modelling
SIAT117	Structural Reliability
SIAT118	Testing & Evaluation Techniques
SIAT119	Tyre Technology
SIAT120	Vehicular Electronics
SIAT121	Vehicular Systems

## PANEL DISCUSSION

Panel Discussion on an important topic in line with the Symposium Theme, concerning automotive industry, is organized on the last day of SIAT 2019. Eminent personalities in the field of automotive R&D will take part in Panel Discussion.

## PLENARY SESSIONS

There will be 2 Plenary Sessions with 8 Presentations by world renowned domain experts, on the identified topics of SIAT 2019.

## KEYNOTE PRESENTATIONS

30 Keynote Presentations, by domain experts from India and abroad, are scheduled during SIAT 2019.

## TECHNICAL REFERENCE BULLETIN

Technical Reference Bulletin (TRB), comprising of technical articles, advertisements, etc., will be published to commemorate SIAT 2019. It also provides an opportunity for sharing various technical advancements in automotive technology. Technical articles and notes, case studies, production information, etc., are invited for publishing in Technical Reference Bulletin.

## DELEGATE REGISTRATION

Online delegate registration has been activated on <https://siat.araiindia.com> under “REGISTER NOW” tab for delegates. Details of delegate fee are given below:

Category	Delegate Fee/Each
Indian Author (First Author only)	INR 13000
Indian Delegate	INR 22000
Indian Delegate (Group Discount for 5 or more delegates from same Organization)	INR 20000
Foreign Author (First Author only)	USD 410
Foreign Delegate	USD 820
Foreign Delegate (Group Discount for 3 or more Delegates from same Organization)	USD 750

Around 1200 delegates, representing around 20 countries, along with professionals, engineers and academicians are expected to attend the Symposium.

## VALUABLE SPONSORS – SIAT 2019

AVL India Pvt. Ltd. Gurgaon	Continental Automotive Components (India)	Daimler India Commercial Vehicles Pvt. Ltd., Chennai
DENSO International India Pvt. Ltd., Gurgaon	Hyundai Motors India Ltd., Kanchipuram	IBIDEN Singapore PTE Ltd., India Branch Office, Bengaluru
Maruti Suzuki India Limited Gurgaon	Mahindra & Mahindra Limited Mumbai	Mercedes Benz India Private Limited, Pune
Renault Nissan Technology Business Centre India, Chennai	Tata Motors Limited, Pune	Toyota Kirloskar Motor Pvt. Ltd., Bengaluru
TVS Motor Company Limited, Hosur	WABCO India Limited, Chennai	Yanmar India Private Limited, Gurgaon

## AWARDS:

Technical Papers (Specified Category)	Technical Papers (Open Category)	Exhibition Stalls (Best Display)	Student Poster Presentation Competition Awards
<ul style="list-style-type: none"> <li>• Best International Paper</li> <li>• Best Oral Presentation</li> <li>• Best Paper on Safety</li> <li>• Best Paper on Simulation &amp; Modelling</li> <li>• Best Indian Paper on Environmental Pollution</li> <li>• Innovation Award on Vehicle Electrification</li> </ul>	First Prize Second Prize Third Prize	First Prize Second Prize Third Prize	First Prize Second Prize Third Prize

## SIAT EXPO 2019

SIAT EXPO 2019, being organized concurrently, would offer an appropriate platform, facilitating spectrum of national / international companies to showcase automotive technology, products as also automotive testing / validation tools and engineering services.



The exposition will attract automotive OEMs, Tier-I/II/III suppliers, CAD/CAM/CAE tool providers, technologists, engineering service providers and test agencies, along with India's finest automotive industry SMEs. Exhibitors will showcase new products, technologies and services, while providing information to potential business partners worldwide, including clients, distributors, exporters, importers, manufacturers and suppliers.

SIAT EXPO 2019 is an excellent platform for promotion of national / international business, networking and dissemination of information.

Over 120 companies are taking part in SIAT EXPO 2019 to demonstrate their products and services through 240 stalls.

## SIAT 2019 WEBSITE

For more details about Conference & EXPO, please visit SIAT 2019 website: <http://siat.araiindia.com>



**Mrs. Rashmi Urdhwareshe**  
Director- ARAI  
Chairperson – SIAT 2019  
Advisory Committee



**Mr. A. A. Badusha**  
Senior Deputy Director- ARAI  
Convenor, SIAT 2019



**Mr. R. S. Mahajan**  
General Manager – ARAI  
Co-ordinator, SIAT EXPO 2019

**Mrs. Rashmi Urdhwareshe, Director, ARAI**  
[director@araiindia.com](mailto:director@araiindia.com)



**The Automotive Research Association of India**

Survey No. 102, Vetal Hill, Off Paud Road, Kothrud, Pune 411 038 (India)  
Tel.: +91-20-3023 1101, 3023 1111 Fax: +91-20-3023 1104