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- **ARAI prepared for AIS 175 WLTP!**
- **ARAI Strengthens Automotive Testing Capabilities with New Office at NATRAX Indore**
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- **ARAI Celebrates World Book and Copyright Day with Book Exhibition cum Sale**
- **ARAI Journal of Mobility Technology (Volume 5, Issue 4, October-December 2025)**
- **ISO 17025 Accredited Calibration Services**
- **ADAS Smart City Test Track**
- **ARAI Unveils National Level Gaseous Cylinder Test Facility Supported by Ministry of Heavy Industries**
- **Symposium on International Automotive Technology (SIAT) 2026 – Brief Overview**
- **International Conference on Hydrogen Electrolyzers & PEM FC / SOFC Technology for Mobility & Power Generation Applications**
- **ADAS Show at ADAS Smart City Test Track, ARAI-MRC, Takwe (near Pune)**

- **Workshop on Sensitization on Automotive Ergonomics**
- **ARAI Onboarded as a Certification Body (CB) under Certification Scheme for Unmanned Aircraft Systems (CSUAS) of DGCA**
- **Development of Facility for CCTV Installation Testing as Per ISO 16001:2017 (ROTAKIN MANIKIN)**
- **Facilities and Expertise for Diesel Emission Measurement in Mining Applications (Surface & Sub - Surface Level)**
- **Comprehensive Performance and Structural Durability Evaluation for Electric Buses**
- **Advanced Friction Torque Testing Service for Engine Oil Optimization and Fuel Economy Improvement**
- **Vendor Development Drive & Buyer Seller Meet**
- **ARAI Journal of Mobility Technology (Volume 6, Issue 1 January-March 2026)**

❑ Development of India's First Electric / Series Hybrid Electric Fishing Vessel

Mumbai Research Centre of ICAR-Central Institute of Fisheries Technology (ICAR-CIFT) and ARAI successfully launched "Vikalpika" – India's first Electric & Series Hybrid Electric Fishing Vessel – on 26th May 2025 at Gorai Creek, Mumbai.

The diesel engine-powered fishing boat having gross weight of 5 tons is converted into a Battery-Operated Electric Version using Model-based simulation, design and analysis techniques. The supply chain is created for getting the electric drive system and components as per the required specifications and for meeting the present AIS functional and according to safety requirements. Considering the need for redundancy in case of battery depletion due to severe weather conditions at sea, a series hybrid electric version as an alternate / improved version is designed and developed. Controllers for pure electric and hybrid electric versions are developed by making in-house high-fidelity mathematical models of electric drive systems and deployed on real-time micro controllers for efficient and fail-safe operations of the boat. Physical prototype is developed for Electric and Series Hybrid Electric Versions and tested in the sea under full load conditions for maximum velocity, number of operation hours and on-board charging of battery and simultaneous propelling of the fishing vessel at low SoC condition of battery due to available on-board Series Hybrid System. ARAI, Dept. of Fisheries and CIFT tested the prototype fishing vessel at Gorai Creek, Mumbai, for functional performance in the Sea with full gross weight (2 ton fish catch + 3 ton curb weight of vessel).

This groundbreaking innovation represents a major milestone in the national effort to decarbonize India's marine fisheries sector, in alignment with the country's climate-resilient and sustainable development goals. Up to 70% reduction in fuel consumption is possible as compared to conventional vessels.

This project promises brighter future for Maharashtra's fishing industry. By transitioning to renewable energy solutions, we can ensure thriving future for next generations, safeguarding the environment, empowering communities and propelling economic prosperity.

Key Features of Vikalpika:

- Length: 7.92 m (26 feet)
- Propulsion System: Electric / Series Hybrid Configuration
 - 20 HP Diesel Engine
 - 20 HP Continuous Power PMSM
 - 12 kW/h Lithium Battery Pack (Primary Propulsion)
 - 1.65 kW Solar Panel System (Supplementary Source)
- Operational Range: Up to 10 km Offshore
- Endurance: 8–10 hours per full charge
- Fuel Reduction: Up to 70% as compared to that of conventional vessels
- Return on Investment (ROI): Estimated to be 3.5 years



Fig. 1: Electric / Hybrid Electric Boat Developed from Concept



Fig.2: Launch Ceremony - Electric & Hybrid Electric Boat for Fisheries Application

The event was graced by Dr. N. P. Sahu, Director (In-Charge), ICAR-CIFE Mumbai, as the Chief Guest. He emphasized on the vital importance of adopting green technologies in India's pursuit of net-zero emissions and commended the collaborative efforts of ICAR-CIFT and ARAI.

Formal launch and flagging-off of Vikalpika was conducted at Gorai Creek, followed by media interactions. In his remarks, Dr. George Ninan indicated that *Vikalpika* stands as a shining example of cross-sectoral collaboration and technological innovation for sustainable fisheries development.

The vessel is now set to undergo field trials at selected coastal sites in Maharashtra to validate its performance, energy efficiency and economic feasibility in real-world fishing operations.

Officials of Department of Fisheries, Government of Maharashtra, ICAR-Central Institute of Fisheries Education Mumbai, ICAR-CMFRI Mumbai, Fishery Survey of India, Marine Products Export Development Authority (MPEDA) Mumbai, SASMIRA (Synthetic & Art Silk Mills' Research Association) Mumbai, ARAI Pune, Bank of India Mumbai Headquarters, Fibre Tech Gorai, Innovegic India, Bangalore, MP Ensystems Goa, attended the event.

❑ Unified Compliance Platform for CSFC and WVSCoP: Advancing CMVR TAS Digital Ecosystem

Introduction:

Delta System was introduced by ARAI roughly fourteen years back and since then it has been in regular use in serving the auto industry. However, with the technological advancements in the software industry, it started lacking and slowly started becoming a storage and data entry software and this wasn't the visualized aim of the DELTA Portal. ARAI Homologation Management and Regulations Dept (HMR) had initiated technical and digital innovation platform CMVR TAS in 2020 after taking inputs from the Industry and internal stakeholders with an aim to provide enhanced and apparent interface to all the stakeholders. HMR completed User Acceptance Testing and unveiled the portal on 15th July 2021 for the user-industry to have working experience.

India's automotive regulatory ecosystem requires compliance at both Type Approval (TA) and production stages. Conformity of Production (CoP) ensures vehicles manufactured post-approval adhere to the certified specifications. With the evolving standards, digitalization of CoP is essential for reducing cycle times, improving traceability and enhancing stakeholder experience. To ensure that vehicles continue to meet quality, safety and performance standards established at the time of type approval, Conformity of Production (CoP) frameworks are mandated in India. Two critical CoP regimes are CSFC CoP (Constant Speed Fuel Consumption CoP) as per AIS 149 and WVSCoP (Whole Vehicle Safety CoP) as per AIS 017 Part 6. While CMVR Type Approval System (TAS) has matured over nearly five years serving the large stakeholder base with high user interface and acceptance and is widely adopted for TA processes, it did not originally provide specialized capabilities for CoP management requirements that differ from type approval processes. Absence of dedicated CoP platform for first cycle (Dec 2022 to March 2025) resulted in manual processes, fragmented workflows and limited analytics. Integrating CoP module into TAS provides a single-window solution, reducing complexity and cost while improving efficiency. The integration of CSFC CoP and WVSCoP modules into CMVR TAS delivers unified, efficient and compliant digital ecosystem for India's automotive industry. By leveraging TAS's present infrastructure and user familiarity, the solution ensures cost-effectiveness, operational efficiency and readiness for future regulatory evolution.

Regulatory Background:

CSFC CoP (AIS 149): Validates fuel consumption at constant speeds of any model randomly selected from the plant, ensuring benchmarks match as per the regulations.

WVSCoP (AIS 017 Part 6): Confirms the safety critical components fitted on the vehicle and vehicle level test to check that the performance of the vehicle remain compliant post-approval.

CMVR Framework: Governs TA and CoP processes under Government (MORTH) notifications and AIS / IS standards.

Present functional features as introduced in the portal are mentioned hereunder. The document will also summarize the benefits all the stakeholders can have with the new portal, ensuring that the new system always remains relevant and updated with the new technology and user experience design.

Problem Statement:

Current TAS workflow do not support CoP-specific requirements, such as:

- New data fields and validation rules.
- Sampling and batch management tools.
- Audit trails and traceability across VIN batches.
- Integrated **CAPA** (Corrective and Preventive Action) handling.
- Real-time collaboration for non-conformance resolution.

Objectives:

- **Unify** CSFC and WVSCoP workflows under CMVR TAS.
- **Digitize** end-to-end CoP processes: planning, sampling, testing, reporting, approvals, CAPA.
- **Standardize** templates and data models per AIS 149 and AIS 017 Part 6.
- **Enable** audit-grade traceability and compliance dashboards.
- **Leverage** TAS familiarity for rapid adoption and cost efficiency.

Functional Features:

- **CoP Planning:** Tentative month of selection, manufacturing plant details, sampling logic, traceability of person
- **Sampling Management:** VIN capture, statistical sampling.
- **Non-Conformance Handling:** CAPA workflows, evidence tracking.
- **Approval & Certification:** Digital sign-offs, compliance reports.
- **Analytics:** MIS, Real time dashboards and data capture.
- **ISO 9000** audit requirements data analysis is available on line.
- Digitized and secured **Proforma Invoice, Final Invoice, Test Reports and CoP Certificates**
- **EOHS** paper consumption target at ARAI level drastically reduced
- **Alerts and email notifications** have been introduced to notify customers for every significant operation taking place in system and highlighting any actions to be taken by customer.

The System will also help customers to **identify departments, engineers assigned to their case, person visiting the plant for CoP selection** and at the same time **progress of testing at each Department** in each case by clicking on the “i” button.

A **Real Time Case List** is provided to check latest status of all their applications. Customer is also provided an option to review the case at a glance by clicking “i” button.

Query Module has been introduced, which will be used for communication between customers and Departments at ARAI involved in the respective case.

Audit will enable customer to access audit trail of a particular case. This will contain all the actions taken by customer and ARAI in chronological order. This will be very helpful in maintaining the record for all the cases for future reference.

Repository: Most of the time customer has to submit same test report for various cases. TAS has a unique feature of Repository, which will be used as a storage place for all the data and later can refer in any case that will save time and reduce document clutter for case. Repository will also help all the Departments to find any reports uploaded on CMVR TAS with the help of Report Number.

Conclusion:

CSFC CoP Module and WVSCoP Module was launched on 25th April and 16th July 2025 respectively at the hands of Dr. Reji Mathai, Director-ARAI in the presence of Team-ARAI. Integrating CSFC CoP and WVSCoP modules in CMVR TAS delivers unified, efficient and compliant digital environment for India’s automotive ecosystem. By leveraging TAS’s established user base and infrastructure, the solution minimizes transition friction, reduces operational costs and strengthens end-to-end compliance from type approval to sustained production quality and safety. The proposed architecture, workflows and governance model positions the platform to adapt to evolving standards and industry needs.

GO LIVE EVENT
of the Newly Developed
CSFC-COP Software
Module in
CMVR-TAS Portal
An Online Portal for Handling
Applications Related to CSFC-CoP

Dr. Reji Mathai
Director
ARAI

Shri A. A. Badusha
Senior Deputy Director &
Head – HMR, VEL & PLIC

25th April 2025
11:00 AM



GO LIVE EVENT
of
WVSCoP - Module
under
CMVR-TAS
16th July 2025
ARAI

Dr. Reji Mathai
Director
ARAI

Shri A. A. Badusha
Senior Deputy Director & Head
– HMR, VEL & PLIC

Welcome to the
GO LIVE EVENT
of
WVSCoP - Module
under
CMVR-TAS

Go Live Event of WVSCoP Module

❑ ARAI bags the prestigious Golden Peacock Innovative Product / Service Award, 2025



Director, ARAI receiving Golden Peacock award on Leadership for Business Excellence and Innovation at UAE Global Convention in Dubai, April 2025

Institution of Directors (IOD) felicitated ARAI for work on Development of Lightweight Aluminium Superstructure for Indian City applications. This is the result of continual efforts towards innovation for devising safe and sustainable solutions for Indian mobility sector.

About Invention:

Design and Development of Lightweight Aluminium Superstructure sought to addresses issue of making bus superstructure lightweight for improving fuel economy without affecting strength, durability and safety. Unique Aluminium extrusion profiles and its joinery is designed and developed to construct bus superstructure. The invention encompasses novel mechanical joining the method involving Aluminium extruded profiles fastened via unique Aluminium forged / extruded gussets, specifically designed for the extruded profiles to construct bus superstructure.

Conventional vehicle bus construction involves welded steel structure, which is heavy and prone to rusting. To address this issue aluminium superstructure product is developed with the following unique features:

- Aluminium extrusion profiles configured to self-align and securely interlock in profiles of angular and flat gussets to form a rigid joint by maintaining surface to surface frictional contact at the joint for increasing load carrying capacity of joint and ease of assembly and improving accuracy
- Welding is eliminated and hence there is no Heat Affected Zone (HAZ) and that results in no stiffness reduction of parent metal and no durability failure due to crack initiation from HAZ and further propagation resulting in failure. Joining is only through mechanical fastening, angular and flat gussets, resulting in higher structural durability.
- Higher recyclability of Aluminium superstructure up to 95%



Precise Benefits:

- Over 30% weight reduction in bus superstructure compared with the existing steel superstructure, resulting in better fuel economy / range improvement of 10 to 12%
- For city bus application, ~3000 ltr of fuel saving per year per bus considering 180 – 200 km of daily travel and 85% utilization in a year.
- No warpage of bus superstructure due to cold assembly (absence of welding)
- Weld spool reduction by 90% resulting in cleaner work environment
- Easy assembly of superstructure with increased accuracy
- 40% reduction in bus body development cycle time
- Corrosion free increased bus life

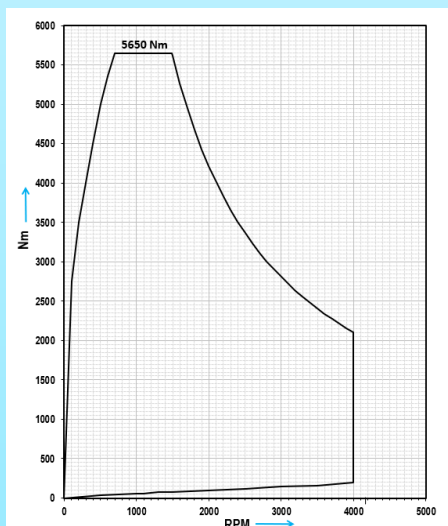
Aluminium lightweight Bus meets all the regulatory requirements, viz. AIS:052 Bus Body Code, AIS:153 and MoUD requirements and structural durability requirements.

The innovation resulted into providing indigenous, cost effective and import substitute solution for light-weighting of bus fleets. Aluminium bus design is Patented (Patent Number # 476062 Date of Grant 1/12/2023) with title "A Joint for Assembling Vehicle Body". This patent is jointly held by ARAI & Hindalco.

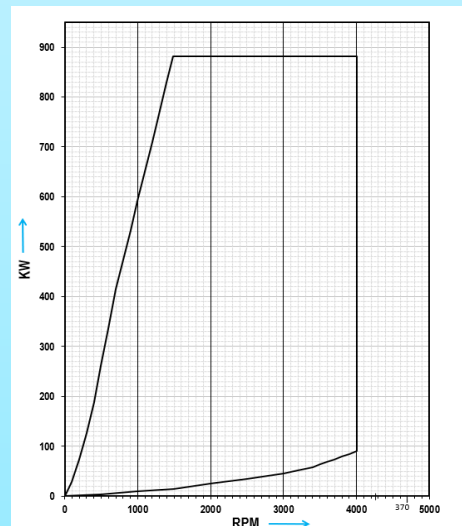
Advanced Engine Steady State Testing Facility for Heavy-Duty IC Engines Up to 800 kW

Engine Development Lab of ARAI has established state-of-the-art engine test facility for **heavy-duty internal combustion (IC) engines**. The facility enables testing of engines up to **800 kW mechanical output, 5650 Nm torque** and operating at speeds up to 4000 rpm.

Dynamometer performance curve for speed and torque vis-à-vis Power output is as below.



Graph 1: Torque curve



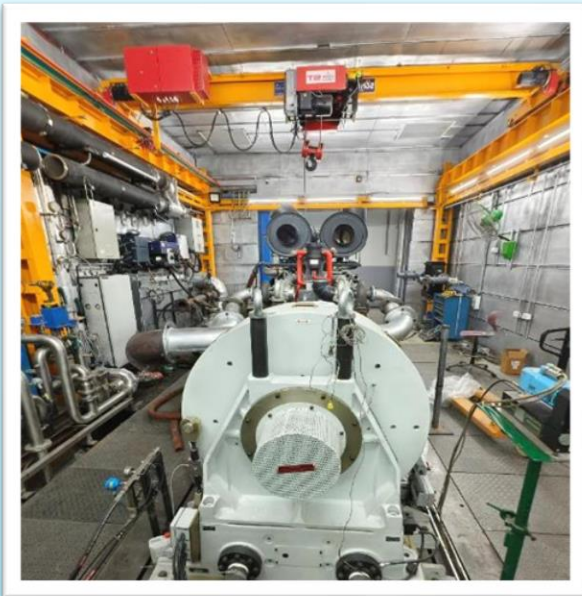
Graph 2: Power curve

The facility is equipped with sophisticated instrumentation and control systems that ensure precise data acquisition and analysis across a wide range of operating conditions **along** with emission and particulate measurement system and other fuel, coolant and air conditioning system and thus enabling **comprehensive performance, emission, and endurance evaluations resulting in** meeting both current and future regulatory standards.

The facility is accredited to ISO/IEC 17025:2017 and it will support certification for high power rated **commercial vehicles, construction equipment, and Genset engines thus** Strengthens ARAI's position as a technical partner for OEMs and regulators some of the applications.

Applications:

- Advanced combustion development for Power and Emissions conventional and alternate fuels
- Non-automotive (CEV, Tractor, Genset, Earth Moving Vehicles, Material handling equipment and Mining Vehicles) engines
- Retrofit Emission Control Devices (RECD) development and certification for high-power applications
- Fuel efficiency and thermal management optimization



This facility will serve as a platform for validating next-generation heavy duty engine concepts, enabling data-driven insights and technology readiness for future mobility solutions.

❑ Acoustic Vehicle Alerting System (AVAS) Evaluation Capability at ARAI

Now a days, demand for Electrified Vehicles (EVs) is significantly increasing over conventional Internal Combustion Engine (ICE) vehicles. The shift from the familiar sound of internal combustion engines to the quieter hum of Electrified Vehicles has created an unforeseen challenge in vehicle recognition, particularly at lower speeds. Electrified Vehicles are supposed to generate an artificial alert sound for pedestrian ensuring safe usage of roads and fleets. Acknowledging the vital need to safeguard pedestrian safety, Government of India has decided to establish standard for minimum sound emission requirements of Electrified Vehicles and regulate these standards for safer future. In line with this necessity, AIS-173 standard has been developed and draft Notification No. G.S.R. 714(E) has been issued to this effect.

Consequently, electrified vehicles must be fitted with Acoustic Vehicle Alerting Systems (AVAS) as mandated by regulatory authorities. Therefore, sounds generated by AVAS are required to comply with specific regulatory standards. This stipulation necessitates compliance testing for all types of electrified vehicles, including PEVs (Pure Electric Vehicles), HEVs (Hybrid Electric Vehicles), FCEVs (Fuel Cell Electric Vehicles) and Fuel Cell Hybrid Vehicles (FCHVs).

ARAI has developed AVAS testing capabilities and facilities in accordance with AIS 173 Standards to assess minimum sound emission requirements concerning sound pressure level, 1/3rd octave band and frequency shift. NVH Lab of ARAI is equipped to conduct both outdoor and indoor testing as per AIS-173. ARAI offers indoor testing facilities, which include hemi-anechoic chambers at two locations in Pune (Kothrud and Chakan) and offers outdoor testing capabilities at various testing tracks available in the country. All necessary facilities for evaluating electrified vehicles are in compliance with the requirements set forth by AIS-173.

Additionally, NVH Lag offers developmental services, including AVAS development, sound signature creation, AVAS integration into vehicles, component-level assessment and vehicle-level evaluation, among others. This progress allows stakeholders in the electric vehicle sector to easily test their vehicles those are equipped with AVAS.

Overview of different methods of evaluating AVAS installed on vehicles in accordance with AIS 173 :

1. Test in an Indoor Facility:

- i. Evaluation of entire vehicle while in motion within an indoor facility utilizing chassis dynamometer (Method C as per AIS-173). This approach is highly recommended for testing as it allows to assess the vehicle under dynamic conditions without interference from environmental noise, resulting in enhanced accuracy and reliability. ARAI's hemi-anechoic chamber facility complies with the standards set forth in ISO 26101:2012.
- ii. Evaluation of entire vehicle while stationary in an indoor environment, simulating vehicle speed to AVAS using external signal generator (Method D as per AIS-173).

2. Test on an Outdoor Test Track:

- i. Testing of complete vehicle in motion on an outdoor test track (as per method A).
- ii. Testing of complete vehicle in standstill condition on an outdoor test track with simulation of vehicle speed to AVAS by an external signal generator (as per method B).

Evaluation of AVAS unit in the absence of a vehicle within an indoor environment, utilizing simulation of vehicle speed directed to AVAS via external signal generator (Method E as per to AIS-173 for frequency shift requirement). This approach is applicable solely for developmental testing at the component level.



Figure 1: Vehicle with AVAS unit under test on Chassis Dynamometer

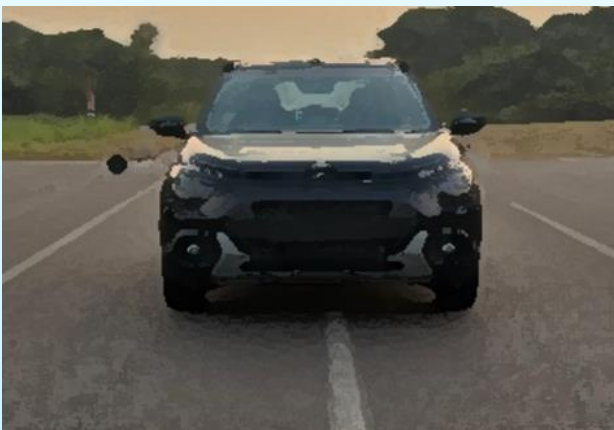


Figure 2: AVAS testing at outdoor test track in Dynamic and Standstill condition



Figure 3: AVAS unit without a vehicle under test

Why ARAI

- Key player in Indian Automotive NVH development
- Database of over 100 powertrains, over 50 vehicles, over 1000 acoustic trims and automotive sub-systems
- Quick turnaround time with proven tests and simulation methods
- Comprehensive test facilities like Hemi-anechoic chamber coupled with chassis and engine dynamometers, reverberation chambers, head and torso simulator, test rig for trim and component evaluation, over 200 channel data acquisition capability

ARAI NVH Capabilities

- Vehicle Benchmarking & Target Setting
- Noise Source Identification using Transfer Path Analysis (TPA)
- Sound package material characterization
- Combustion Noise Analysis
- Engine Calibration Optimization
- Off-road Vehicle and Construction Equipment NVH reduction
- Tire Noise Analysis
- Experimental Transfer Function Evaluation
- Operational Modal and Deflection Shape Analysis
- Exhaust & Intake system Design

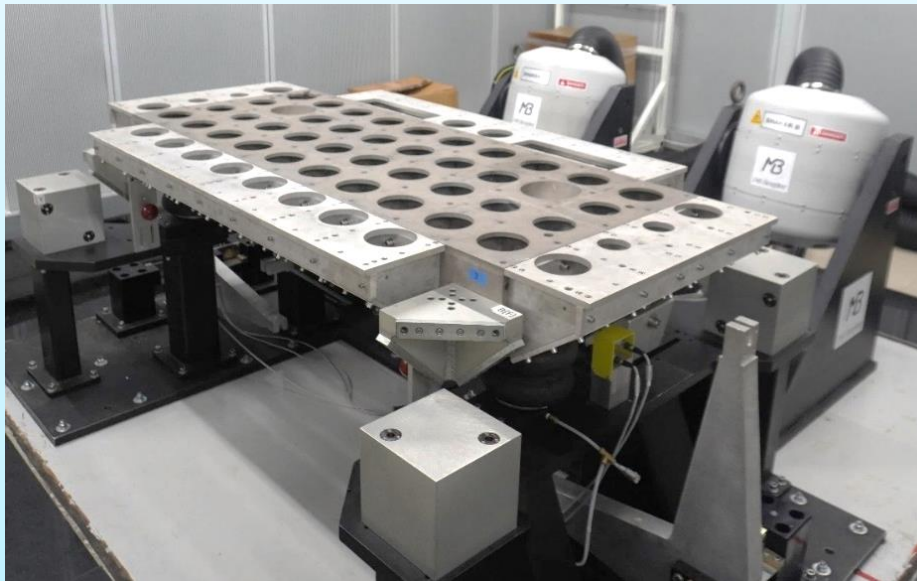
ARAI NVH Major Facilities

- Hemi-anechoic chamber with Engine and Chassis dynamometers
- Reverberation chamber suite with anechoic chamber
- Test Rigs for acoustic material evaluation
- Over 200 channel data acquisition systems
- Head and torso for sound quality analysis

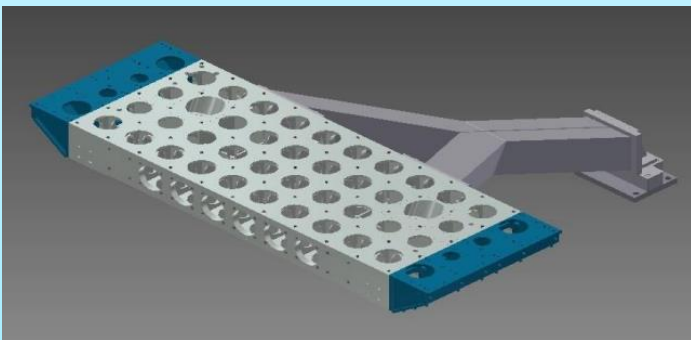
❑ Component and Sub-System Buzz, Squeak, Rattle Test Facility with Table Extenders

Buzz, Squeak and Rattle (BSR) component test facility of MB Dynamics (USA) make is established at ARAI for meeting TIER-I supplier requirements. Current demand of OEMs for BSR assessment for pre and post durability evaluations. To cater to mount large size components, viz. IP panels for LCVs, IP panel with floor consoles, sunroof systems, quarter vehicle bucks, table extenders were installed in the component BSR test rig. Table extenders comprises of front, rear, left and right extenders. With the installation of table extenders, overall table size is now increased to 1921 mm in width 1021 mm against the earlier size of 1500 mm x 600 mm.

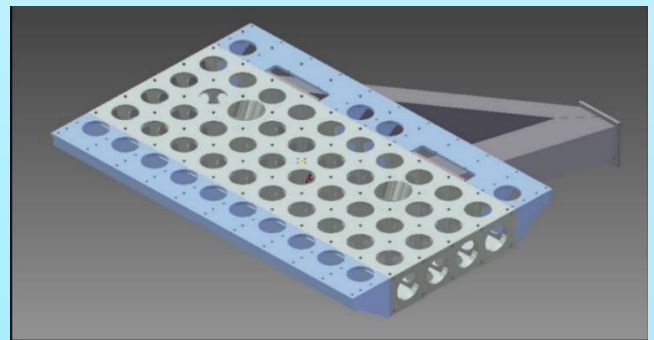
With the expansion of table extenders, technical specifications of the BSR rig, viz. maximum vibration level of 1.5 g rms for normal mode operation, 1.0 g rms for silent mode operation, maximum payload of 315 kg for all modes of operation (VPR, vertical, fore-aft and lateral) are retained. With the table extenders, wider and longer size non-automotive components, viz. electronic components, white goods and industrial equipment can be evaluated for BSR issues. Other advanced applications to include root cause analysis of critical components and vehicle sub-systems, noise and vibration source identification, operational deflection shape / modal analysis and fixture design/validation for different components.



BSR Test Rig with Front, Rear and Side Extenders



Left and Right Extenders



Front and Rear Extenders

❑ Advanced E-Axle Testing and Validation Facility: Accelerating EPT Development

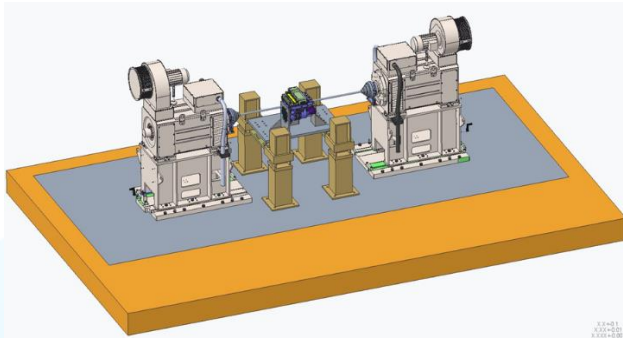


Fig. 1: EV Powertrain connected to 2dynos



Fig. 2: 600kW DCPS

The **state-of-the-art Powertrain Test Rig** is established to support advanced testing and validation of **e-axle systems** and electric vehicle (EV) powertrains. This facility is equipped with **two high-performance dynamometers**, each capable of delivering up to **220 kW of power** and **2200 Nm of torque**, resulting in a **total loading capacity of 4400 Nm and 440 kW**. This test bench has advanced features such as Road Load Simulation (RLS) that can support to replicate on road behaviour of test specimen when subjected to various load conditions.

This facility is also integrated with 600 kW DC Power Supply. This 600 kW powerhouse enables precise testing of EV components including e-motors, e-differentials, e-axles and hybrid drivetrains for both passenger cars and commercial vehicle applications. It is a unique system featuring two independent channels of 300 kW each. Its bidirectional energy flow feature supports for validation of regenerative conditions of powertrain.

This robust infrastructure enables a wide range of testing services tailored to the evolving needs of the EV industry:

- **Performance and Durability Testing:** Comprehensive evaluation of EV powertrain systems under various load and temperature conditions to ensure long-term reliability and efficiency.
- **Hardware-In-Loop (HIL) Testing:** Integration of real-time simulation environments for testing individual powertrain components, enhancing development accuracy and reducing time-to-market.
- **Parklock Evaluation:** Rigorous testing of transmission parklock mechanisms to validate safety and functionality under diverse operating scenarios.
- **Component Validation:** Specialized validation services for **DUJ/CV shafts** and **hybrid Dual Clutch Transmissions (DCTs)**, ensuring compliance with performance standards and durability benchmarks.
- **Function Validation:** critical functions like cornering and software functions, like Torque vectoring of e-differentials can be validated.

With its cutting-edge equipment and versatile testing capabilities, the Powertrain Test Facility stands as a critical enabler for innovation, quality assurance and accelerated development in the electric mobility sector.

This facility is established at Drivetrain Development Centre (DDC), HTC-NVH located at Chakan to offer services to all OEMs and component manufacturers.

❑ ARAI Prepared for AIS 175 WLTP!

ARAI inaugurated India's first Evaporation Emission Measurement System via Canister Aging Bench at its Homologation Technology Centre (HTC), Pune on 9th July 2025. This was a major step towards enhancing ARAI's Emission Certification capabilities well in advance of WLTP regulation implementation in India.

With the release of a draft notification S.O 270 (E) dated 28th April 2025 for implementation of Worldwide Harmonized Light Vehicles Test Procedure as per AIS 175, ARAI demonstrated its preparedness to enable the industry develop and validate as per global standards.

On the occasion, Dr Reji Mathai, Director-ARAI, highlighted India's roadmap for emission control with innovations like E20 and biofuel being explored for India's green mobility mission. He added that the auto industry should come together to work towards innovations aligning with domestic requirements.

The facility is compliant to AIS 175 WLTP and Global Technical Regulation (GTR) 19 with capability for ageing the canister by Gasoline fuel with Ethanol content up to 85% (E85) along with performing the Automatic Test Sequence as per:

1. INDIA - AIS 137 Part 1,2, 3 and AIS 175
2. UNECE GTR-19 (WLTP EVAP)
3. ECE Regulation No. 83 Annex 7 (Type IV Test)
4. Europe Directive 70/220/EEC, 715/2007/EC, 692/2008/EC, 1151/2017/EC, 1154/2017/EC, 168/2013/EC
5. EPA CFR 40 Part 86.153-98
6. EPA CFR 40 Part 1066 (referring to EPA Part 86)
7. CARB CCR 13 Part 1976, LEV 1-3
8. CHINA GB 18352.5-2013, Beijing 6 (Draft)
9. JAPAN JASIC 11-3-49 Part 8f

Applications:

- Canister aging / stabilization as per AIS, ECE, CARB regulations as above
- Canister working capacity evaluation
- Standard canister conditioning
- Puff-Loss Simulation
- Leak check procedure
- Combined-System for flexible use of Butane/N2 or Fuel Vapor/N2 mixture with Real fuel aging (300 Cycles) followed by 5 cycles of Butane/N2 for BWC determination
- BWC validation

Additionally, as a part of preparedness for AIS 175 WLTP, ARAI has enhanced its existing vehicle emission test facilities with upgradation of 4x4 Chassis Dynamometer and Test Automation Systems.



❑ ARAI Strengthens Automotive Testing Capabilities with New Office at NATRAX Indore

ARAI has expanded its footprint by establishing dedicated office at **NATRAX (National Automotive Test Tracks), Indore**, a move set to accelerate India's automotive innovation and compliance ecosystem.

This facility of new workshop provides test area for conducting static evaluation of vehicles such as Tell tales, CMVR checks, etc. also provide ARAI customers a lounge, meeting conference room, etc.

NATRAX, one of Asia's largest and most advanced vehicle testing facilities, offers **14 specialized tracks**, including an **11.3 km high-speed track**, dynamic platforms and ADAS evaluation setups. With ARAI's presence on-site, manufacturers can now validate cutting-edge technologies such as autonomous driving features, lane-keeping systems and collision avoidance under controlled conditions, ensuring safety and reliability. With ARAI's presence on-site, manufacturers can now access **faster homologation and certification services**, reducing turnaround time and enabling quicker product launches.

This strategic location near **Pithampur industrial hub** ensures proximity to major OEMs and component suppliers, cutting logistics costs and improving efficiency. The collaboration also supports testing for **electric vehicles, autonomous technologies and advanced safety systems**, aligning with India's vision for future mobility.

By leveraging NATRAX's world-class infrastructure and ARAI's technical expertise, the industry gains robust platform for **innovation, compliance and global competitiveness**. This expansion strengthens ARAI's major presence outside Pune, reinforcing its role as a national leader in automotive research and certification.



□ ARAI Signs MoU with ASDC to Offer NSQF Certified Courses in Electric Vehicle Technologies

ARAI has signed an MoU with Automotive Skills Development Council (ASDC), New Delhi, on 4th April 2025, to collaboratively offer **National Skills Qualification Framework (NSQF)** aligned courses in Electric Vehicle (EV) domain.

Under this partnership, ARAI Academy will conduct two specialized NSQF Level 5.5 NOS courses:

- *Fundamentals of Electric Vehicle Battery Pack Design*
- *Fundamentals of Electric Vehicle Powertrain Design*

Professionals desiring to work in EV domain would either work on powertrain design (motor and related knowledge) or battery design (power source) or both. Because of huge push on electric vehicles, skilled manpower with practical and hands-on exposure becomes imperative. Above two programs are introductory courses of 60 hours duration each, with 70% of time devoted to hands-on and practicals. Such courses become a good appendage for engineers who are acquiring knowledge on other engineering concepts and having more of theory exposure in their regular 4-year degree program. Additionally, for a three-year diploma student, such a practical-rich training module gives an insightful chance to venture into EV domain.

Also, working professionals already in the automotive domain, who are willing to move towards electric mobility would initiate their journey with this first course and then continue further with many such courses, which would be jointly designed by ARAI and certified through ASDC under the NV CET curriculum.

The initiative aligns with India's growing emphasis on EV skill development, complementing national initiatives such as FAME, PM E-DRIVE and PLI schemes. This initiative definitely supports ARAI's long-term vision of expanding its training ecosystem and enhancing employability through accreditation under NCVET.

Course Highlights:

- 60 hours curriculum duration, with 70% hands-on and practical exposure
- NSQF-accredited (ASDC-certified) certification
- Practical and project-based learning modules
- Hands-On, Application-Based Demonstrations
- Delivered by ARAI SMEs who are NSQF-Certified Expert Trainers
- Industry-recognized certification by ASDC

For more details visit: www.araiindia.com/services/knowledge-dissemination



❑ ARAI Celebrates World Book and Copyright Day with Book Exhibition-cum-Sale

Knowledge Centre (KC) at ARAI organized a lively book exhibition and sale on 23rd and 24th April 2025 to encourage employees, students and visitors to read more and build a reading habit. The event highlighted how books inspire people and share knowledge, while noting that the technology improved access to various sources of information through reading. It aimed to promote reading, raising awareness about copyright issues and creating a space for people to interact, share ideas and enjoy literature.

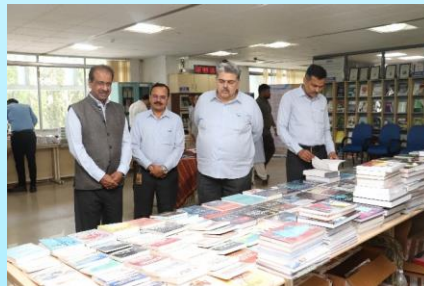


Book Exhibition inaugurated at the hands of Dr. S.S. Thipse, Sr. Dy. Director Head – EDL, ERL & KC and Mr. Anand Deshpande, Sr. Dy. Director, Head – AED Dept.

The exhibition displayed over 1,500 books in genres like fiction, non-fiction, technical literature and children's books, with sessions explaining copyright laws and their importance.

Five publishers, including R K Publications, Allied Publications, BSP Publications, Bombay Book, and Kabadwal Publications from various places, like Pune, Chennai, Hyderabad and Mumbai participated in the Exhibition. Attendees enjoyed discounted purchase of books and many bought titles at lower prices. Feedback was very positive, with 95% rating the event as excellent and 90% wanting similar events in the future. The celebration succeeded the goal, enriching the community's culture and linking literature with technology. KC thanked all the participants, publishers and Director-ARAI for supporting the culture of reading and learning.

Glimpse of exhibition:





[ARAI Journal of Mobility Technology](#) is a technical journal that focuses on automotive and related topics. It is available in ONLINE and PRINT version.

This journal was started to help professionals, researchers and students to share their original research in the field of mobility technology. One of its goals is to provide platform for publishing articles on variety of automotive and allied subjects. Papers published in this journal are well-promoted in the automotive and research communities.

The journal welcomes contributions from researchers all over the world as well as that from scholars, academics and professionals in the automotive industry.

The 4th edition of the journal for year 2025 (**Volume 5, Issue 4, Oct-Dec 2025**) is released online. For more details, you can visit the journal's website at <https://araijournal.com/index.php/arai>

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Journal Indexed in



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❑ ISO 17025 Accredited Calibration Services

ARAI's Calibration laboratory is one of the leading calibration laboratories in India and has been offering calibration services for various parameters for more than 30 years. With its Motto "Quality Assurance Through Calibration", ARAI's Calibration Lab is equipped with state-of-the-art calibration facilities enabling calibration of various parameters under one roof. Most of the services are accredited as per ISO 17025 through world renowned organizations such as NABL and IAS. Its qualified and experienced staff strengthens the capabilities and also provides turnkey **Calibration services of entire Test cells or facilities.**



❖ Accreditation Certificates



In its quest to continuously update and upgrade itself, the Laboratory has added new services and capabilities.

Load Cell Calibration Facility

CAL Lab of ARAI has newly developed the capability to calibrate instrumented dummy load cells and seat belt load cells along with conventional universal load cells, S-type load cells and special purpose load cells. **The facilities are multi location with presence at ARAI, Kothrud as well as ARAI-HTC, Chakan. Both the facilities are ISO/IEC 17025:2017 accredited by IAS (International Accreditation Service).** This accreditation is a recognition of technical competency, quality management and commitment towards accurate, precise & reliable calibration.

This accredited calibration capabilities includes:

1. Types of Load cells – Universal, Seat Belt, Dummy, S-Type & Special Purpose Load cells, etc.
2. Range from 100 N to 100 kN
3. CMC from $\pm 0.06\%$ to $\pm 0.1\%$

❖ Reference used for Loadcell Calibration



Reference Loadcell



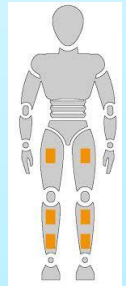
Force Calibration Machine



Instron Machine

Sensor Technology with the satisfaction factor

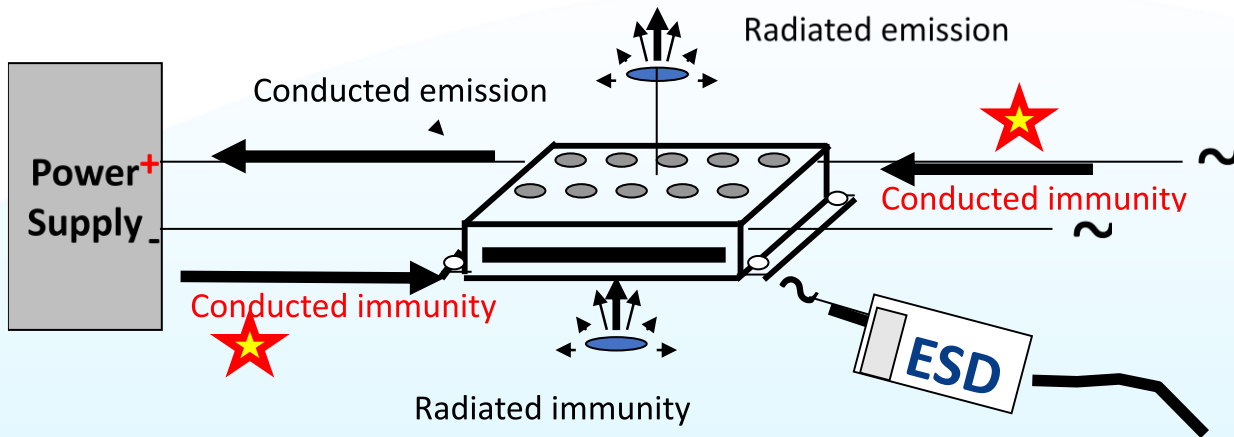
Fast and innovative solutions that meet the highest requirements



❖ **Device Under Calibration Loadcells- Universal, Seat Belt, Dummy, S-Type etc.**

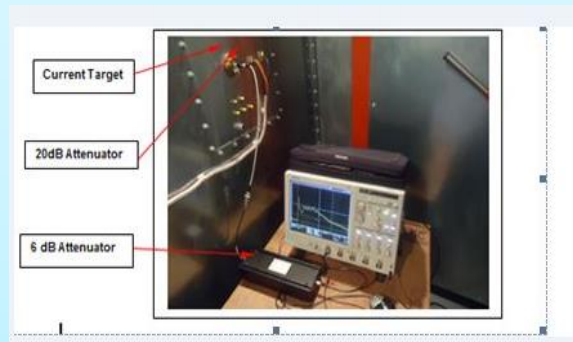
Calibration of Instruments for EMI / EMC Testing

EMI / EMC testing verifies if the devices do not interfere with other electronics equipment / signals and can operate with their intended electromagnetic compatibility and emissions without any errors or malfunctions. The instruments used for EMI / EMC testing need to be critically verified for their accuracy and reliability so that they ensure compliance of the product to the regulatory standards.



EMI/EMC Testing Concepts at a glance

ARAI' CAL Lab has established competency for calibration of such Instruments, which include: Automotive Generators, Non-Automotive Generators, ESD Generators, LISN, Current probe EM clamp, CDN Attenuators etc. Calibration of all EMI / EMC instruments is done as per the procedure prescribed in the latest respective standards (ISO 7637-2, IEC61000 4-4, IEC 610004-5, IEC 610004-11, IEC610004-12, etc.)

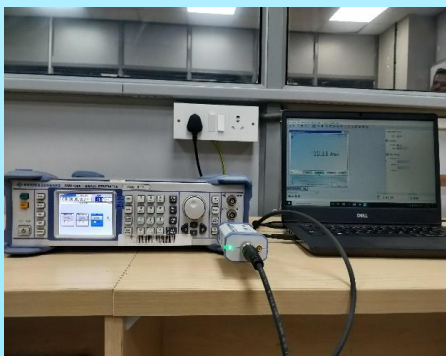


Electro Static Discharge Generator (ESD) & Target Plate Calibration as per ISO10605 and IEC 610004-2

Recently updated for -

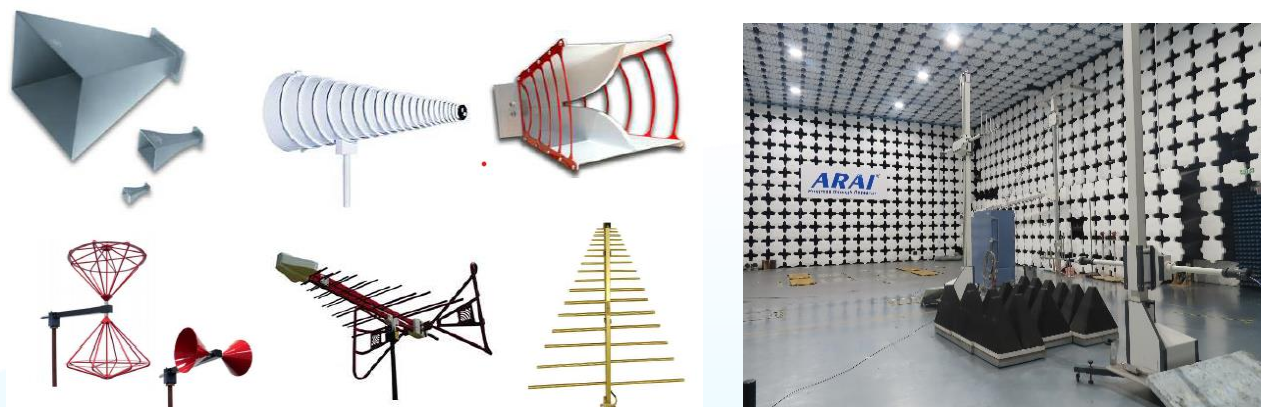
- Signal generator up to 18 GHz with modulation parameters
- Power meter & power sensor up to 18 GHz
- Ring wave generator as per IEC 61000 4-12
- Antenna Calibration – distance as per SAE ARP958

The Lab is accredited by NABL as per ISO/IEC 17025:2017 for calibration of above instruments.



Facility for Signal Generator Calibration

Facility for Antenna Calibration – distance as per SAE ARP958



Enhancement in Electro-Technical & EMI / EMC Scope

CAL Lab of ARAU has wide scope of calibration in Electro-Technical as well as EMI-EMC discipline.

1. Electro-Technical Scope:

Recently, we enhanced our DC current measurement scope up to 500 A and the scope is accredited as per ISO/IEC 17025:2017 by NABL. The accredited CMC is $\pm 0.4\%$ to 0.6% (from 20 A to 500 A).

This will help to measure charging and discharging current of Battery as well high current source equipment.



Current measurement with shunt

Data Acquisition System /Controller Calibration Facility



Data Acquisition System Calibration

For any further information and Calibration requirement, please reach us on info@araiindia.com;
manel.sdl@araiindia.com (+91 020-6762 1521)

❑ ADAS Smart City Test Track

To facilitate industry-led on-track testing of Advanced Driver Assistance Systems (ADAS) and autonomous driving technologies under representative Indian driving conditions, ARAI has established advanced testing facility known as ARAI Intelligent Mobility Test City (IMTC). Spanning over 20 acres, IMTC is designed to replicate real-world Indian road environment through comprehensive simulation of urban and semi-urban infrastructure.



As a part of Phase 1 commissioning, the test track incorporates features, such as four-lane highway road, inner city roads, various junctions, roundabouts, etc. constructed to IRC standards. The test track also includes dynamic perception track, which replicates undulating nature of Indian roads, including crests and dips that cause intermittent visibility—thereby simulating scenarios where objects may suddenly appear or disappear from the sensor field of view, a common challenge in Indian driving conditions. The four-lane highway road is designed to validate ADAS features, such as Autonomous Emergency Braking System, Lane Departure Warning System, Lane Keep Assist, etc. Additional features include bus stops, manholes, street lighting and footpaths. The test track also incorporates Euro NCAP-compliant junction, designed to test various junction crossing scenarios. The test track also includes supporting infrastructure for testing such as EV charging stations, tyre inflation systems and RFID-based boom barrier system that enables timestamped entry and exit along with controlled access to specific sections of the track.



For evaluation of parking-related ADAS functionalities, IMTC houses dedicated two-level facility known as Auto Park Assist Test Complex (APATC). This complex is designed to address wide range of indoor and outdoor urban parking scenarios. It includes outdoor parallel parking, 30° and 45° angled parking, uncovered and covered perpendicular parking and viewing gallery for observation. APATC also features inclined ramps at 8° and 15°, along with circular two-level ramp for gradient-based testing. Indoor facilities at APATC include controlled parking bay environment and Driver-in-the-Loop (DiL) dark room for immersive simulation studies. For operational and technical support, the facility is equipped with office spaces, centralized track control room functioning as mission control and laboratory dedicated to equipment maintenance and calibration. Customer-oriented infrastructure includes workshop areas, conference rooms, weighing pads, vehicle scissor lifts, dedicated Wi-Fi connectivity and weather monitoring station.

Looking ahead to Phase 2 commissioning, IMTC aims to further augment the facility with advanced capabilities such as adverse weather simulation systems, including day/night environment and rain/fog tunnels to replicate diverse Indian climatic conditions. Additional planned enhancements include Radar Cross Section (RCS) measurement set up for sensor calibration and pre-testing as well as dedicated LiDAR and camera calibration laboratories for both component-level and vehicle-level validation. Further, the track will be equipped with private 5G infrastructure to support Vehicle-to-Everything (V2X) communication, enabling validation of next-generation technologies including V2V (Vehicle-to-Vehicle) and V2I (Vehicle-to-Infrastructure) systems. These developments aim to position IMTC as a comprehensive, future-ready test facility for ADAS and autonomous mobility solutions in India.



❑ ARAI Unveils National Level Gaseous Cylinder Test Facility Supported by Ministry of Heavy Industries

ARAI has established state-of-the-art National Level Gaseous Cylinder Test Facility with the support of Ministry of Heavy Industries (MHI), under the Capital Goods Scheme – Phase II. The facility was formally inaugurated by Shri H. D. Kumaraswamy, Hon'ble Minister of Heavy Industries and Steel, Government of India, on 26th January 2026, during Symposium on International Automotive Technology (SIAT) 2026.



This first-of-its-kind project in India facilitates Type Approval Testing, Batch Testing and Periodic Testing of Gaseous Cylinders. A pioneering initiative enabling indigenous development and testing of Type-I to Type-IV gaseous cylinders under Make in India initiative. This Centre is equipped to conduct comprehensive testing of gaseous storage cylinders for Compressed Natural Gas (CNG) in accordance with applicable national and international standards, for both domestic use and export. Additionally, the facility offers essential testing capabilities for hydrogen cylinders, covering pressures 200 bar to 700 bar, thereby supporting India's growing focus on hydrogen-based mobility and energy systems. These facilities will soon be further augmented to enable comprehensive hydrogen cylinder testing. With this initiative, ARAI reinforces its leadership in mobility-related research, testing, homologation and certification, providing globally benchmarked infrastructure to accelerate innovation in clean transportation technologies. These facilities also support obtaining of PESO approvals for gaseous cylinders for both domestic and international manufacturers.

Major equipment installed:

- Hydrostatic Burst Rig
- Hydraulic Pressure Cyclic Rig
- Volumetric Expansion Rig (Hydraulic)
- CNG Pressure Cyclic Rig
- CNG Permeation Rig
- Ultrasonic Machine
- Universal Testing Machine
- Cyclic Walk-in-Chamber
- Material Level testing facility
- Drop Test facility
- Fire test facility



❑ Symposium on International Automotive Technology (SIAT), 2026 – Brief Overview



SIAT 2026 Entrance & Arches

19th edition of Symposium on International Automotive Technology 2026 (SIAT 2026), organized by ARAI in association with SAEINDIA and SAE International, from 27th – 30th January 2026 at PIECC, Pune, was a memorable event and has set a new benchmark in terms of scale, participation and quality in all respect. The theme for SIAT 2026 was “Innovative Pathways for Safe and Sustainable mobility”, focusing on innovative and sustainable solutions for evolving mobility challenges.

SIAT 2026 was inaugurated at the auspicious hands of Shri H. D. Kumaraswamy, Hon’ble Union Minister of Heavy Industries & Steel in the august presence of Shri Shailesh Chandra, MD and CEO - Tata Motors Passenger Vehicles Limited; Shri Prasan Firodia, Managing Director- Force Motors Limited and Vice President - ARAI GC; Dr. Reji Mathai - Director ARAI & Chairman - SIAT 2026 Advisory Committee and Dr. N H Walke, Sr. Deputy Director & Convenor – SIAT 2026.



Inauguration of SIAT 2026 by Shri H. D. Kumaraswamy, Hon’ble Minister (Heavy Industries & Steel)



Total 613 papers published as a part of SIAT 2026 proceedings have unique SAE numbers. The Symposium witnessed presentation of 286 technical papers and 38 keynotes (in 64 Technical Sessions) by eminent experts from 18 countries, covering Automotive Cyber Security, E-mobility, ADAS, Hydrogen Fuel Cell, Alternate Fuel, Advanced Powertrain, Vehicle Dynamics, Testing and Evaluation, NVH, Software Defined Vehicle (SDV), Autonomous Vehicles, etc.



Plenary Sessions & Panel discussions



Technical Paper Presentations

The concurrent SIAT EXPO 2026 was the biggest ever in the history of SIAT, which hosted 387 stalls divided into five zones. There were 275 exhibitors from 10 countries, which is a testimony to the popularity of SIAT across the globe. There was a dedicated special pavilion for Start-ups and Micro & Small Enterprises that had participation of 70 such entities. The EXPO also showcased pavilions, viz. UK Pavilion represented by 15 UK based companies. There was ARAI@60 Pavilion showcasing ARAI's journey, current spectrum of capabilities, future plans and new initiatives, as ARAI is celebrating year 2026 as its Diamond Jubilee year.



SIAT EXPO 2026

To encourage upcoming generation for bringing up its technical skills, **Student Poster Presentation Competition** was organized, which showcased 15 posters in the area of Safe Mobility, Sustainable Mobility and Intelligent Mobility. This gave students an opportunity to showcase their work to the practicing professionals.

Technology Pavilion showcased upcoming automotive technologies presenting futuristic mobility. It highlighted key areas such as Renewable Fuels, Eco-System, Alternative Motor and Battery Technologies with life-cycle analysis, Drive-by- Wire Systems, Connected Vehicles, Software-Defined Vehicles (SDV), Functional Safety (FuSa), Cyber Security, AI applications, Drone demonstrations, etc.



ARAI Technology Pavilion

Shri Bhupathi Raju Srinivasa Varma, Hon'ble Minister of State, Ministry of Heavy Industries & Steel, in his address at the Valedictory Function, applauded ARAI's efforts for successful organization of SIAT 2026, emphasizing the significant role of automotive sector in India's economic growth.



**Shri Bhupathi Raju Srinivasa Varma
Hon'ble Minister of State, Ministry of Heavy Industries & Steel at the Valedictory Function**



Award for best StartUp Exhibitors

Valedictory Function of SIAT2026 was presided by Shri Vikram Kasbekar, Executive Director and CTO - Hero MotoCorp Limited, in the presence of Dr G. Nagarajan, President - SAE India.



Valedictory function & Address by Shri. Vikram Kasbekar

SIAT 2026 and SIAT EXPO 2026 received overwhelming response in terms of delegate participation, technical and keynote paper presentation as well as participation in SIAT Expo 2026. Visit of over 15,000 visitors, in addition to over 2500 delegates, to Expo Stall, set a new record at SIAT EXPO 2026.

❑ International Conference on Hydrogen Electrolyzers & PEM FC / SOFC Technology for Mobility & Power Generation Applications

International Conference on Hydrogen Electrolyzers & PEM FC / SOFC Technology for Mobility and Power Generation Applications jointly organized by ARAI and SAE India-WS on 27th and 28th February 2026 in Pune, brought together industry leaders, researchers, policy experts and academia to deliberate on the rapid developments in hydrogen technologies and their applications in mobility and power generation.

The conference aimed to provide platform for knowledge sharing on green hydrogen production, fuel cell technologies, system integration, safety standards and regulatory frameworks, while encouraging collaborations among the stakeholders working towards sustainable hydrogen ecosystem.

The event was held under the patronage of Dr. Reji Mathai, Director - ARAI and Chairman - SAEINDIA Western Section.

Mr. Siddharth Gupta, Chief Executive of L&T Electrolyzers Limited, presided over the function as a Chief Guest, addressed the gathering and emphasized the importance of accelerating hydrogen technology adoption and strengthening the ecosystem for green hydrogen production in India. In his address, Dr. Sushil S. Ramdasi, Deputy Director, In-charge-Powertrain Design and Convenor of the Conference, highlighted and summarized the importance of the Conference.

The conference witnessed active participation from industry professionals, researchers, academicians and students from India and overseas. Over 100 delegates participated in the conference. Experts from leading organizations such as CSIR National Chemical Laboratory, NTPC Limited, KPIT Technologies and John Cockerill participated and shared their insights.

An industry expo was also organized concurrently where companies showcased hydrogen technology solutions, components and testing systems.

Companies Participated in the Expo:

Pilz India, Nanosol Energy, Super Spares & Services, Simerics Technology India, CSIR - National Chemical Laboratory, h2e Power Systems, Alfa Laval, Dorle Controls

The conference successfully created a comprehensive platform for dialogue and collaboration on hydrogen technologies and significantly contributed to strengthening industry–academia partnerships to advance India's transition towards hydrogen-based clean energy future.

Keynote Sessions:

Topic: Accelerating India's Clean Energy Transition Through Energy Efficiency & Waste Heat Recovery – Electrolyser & Fuel Cell by **Mr. Snehal Suryawanshi (Head of Cleantech -India, Alfa Laval)**

Topic: Mass Scale Implementations, Generation, Storage and Transportation of Cost-effective Green Hydrogen Production Technology by **Mr. Siddharth Gupta (Chief Executive of L&T Electrolyzers Limited)**

Topic: Hydrogen Fuel Cell Electric Hybrids for Commercial Vehicles by **Mr. Tejas Kshatriya (Vice President KPIT Technologies)**

Topic: India's Energy Ambition & Green Hydrogen – From Vision to Reality by Mr. Shekhar Kashalikar (Chief Executive Officer John Cockerill Greenko Hydrogen Solutions)

Topic: NTPC's Green Hydrogen Business Plan – Riding on Pilot Experiences by Mr. K. K. Hota (Chief General Manager NTPC)

Panel Discussion 1:

Topic: Indigenisation of Electrolysers & Fuel Cells for Hydrogen Generation and Applications in Mobility and Power Generation

Panel Discussion 2:

Topic: Proliferation, Rules and Regulations, Testing & Certification - Electrolyzers & Fuel Cells



Mr. N. K. Vaidya, Dr. Sushil S. Ramdasi, Mr. Snehal Suryawanshi, Dr. Yogesh Aghav, Dr. Reji Mathai, Mr. Siddharth Gupta and Mr. Mohan Patil at the Inaugural Function



❑ ADAS Show at ADAS Smart City Test Track, ARAI-MRC, Takwe (near Pune)

ADAS SHOW 2026, jointly organized by ARAI and Aayera on 12th February 2026 at ARAI ADAS Test City at ARAI - Mobility Research Centre (MRC), Takwe, witnessed participation of over 1,200 industry professionals, including representatives of OEMs, Tier-1 suppliers, research organizations, technology providers and Government bodies. The event showcased ARAI ADAS Test City, a 20-acre, purpose-built pseudo-urban testing environment designed to replicate Indian road and traffic conditions. As India's first dedicated ecosystem for on-road ADAS validation, the facility demonstrated its capability to bridge the gap between simulation, controlled track testing and real-world deployment.

Key highlight of the event was the live, on-track demonstration of ADAS functionalities under realistic driving scenarios. Demonstrations included advanced safety and automation features, such as Adaptive Cruise Control, Automatic Emergency Braking, Lane Keeping Assist, Lane Departure Warning, Blind Spot Detection, Traffic Sign Recognition, Driver Monitoring Systems, Night Vision, Traffic Jam Assist, and Automated Parking.

The event also featured:

- Expert-led technical sessions on emerging ADAS technologies and autonomous mobility trends
- A fireside chat addressing industry challenges, opportunities and regulatory developments
- A technology showcase presenting state-of-the-art solutions from industry stakeholders
- Guided access to ARAI's testing infrastructure and validation capabilities at ARAI-MRC, Takwe



Participation of senior Government officials and global automotive leaders underlined strategic importance of ADAS in enhancing road safety and accelerating transition towards intelligent and automated mobility. Overall ADAS SHOW 2026 served as a significant platform for knowledge exchange, collaboration and demonstration of advanced testing methodologies, reinforcing growing role of ADAS technologies in shaping the future of safe and connected transportation in India.

❑ Workshop on “Sensitization on Automotive Ergonomics”

Presently ARAI is carrying out feasibility study for establishment of Ergonomics Lab in ARAI. To seek Industry inputs, ARAI had organized Workshop on “Sensitization on Automotive Ergonomics” on 12th Dec 2025 at ARAI-Kothrud. The event received overwhelming response from all major OEMs across India. Over 70 delegates from all the sectors, including OEMs from 2-wheeler industry, passenger cars, commercial vehicle segments as well as construction equipment manufacturers, like JCB India along with DRDO attended the workshop. Mr. Vijay Pankhawala, Sr. Deputy Director and Mr. Rahul Mahajan, Sr. Deputy Director-ARAI, delivered Welcome Address at the Workshop.

Esteemed guests and speakers:

- Dr. Soguata Karmakar from Depart of Design, IIT Guwahati
- Dr. Ravindra Rajhans having 36 years of OEM experience in Vehicle Design
- Mr. Ashish Rawat-AGM & Mr. Deepak Kumar-DGM from Ergonomics & Human Factors Department - Maruti Suzuki India Ltd, Gurugram, Delhi.
- Dr. Hans-Joachim Wirsching, Sr. Product and Project Manager for ergonomics at Humanetics, Online session from Europe.



❑ ARAI Onboarded as a Certification Body (CB) under Certification Scheme for Unmanned Aircraft Systems (CSUAS) of DGCA

ARAI has established credibility with national and international accreditation bodies in automotive testing and certification. With the advent of drones, mode of transportation is changing and ARAI wanted to adopt this change by involving itself in drone certification activity. With this intent, ARAI has established an Unmanned Aerial Vehicle Certification Cell (UAVCC). For this, ARAI has aligned with the rigorous CSUAS competency standards. ARAI's UAVCC team has undergone rigorous training of ISO/IEC 17065:2012 for Product Certification Bodies and training required for the scheme. Post successful office assessment by Quality Council of India (QCI), ARAI received Approval as a Certification Body (CB) under the Certification Scheme for Unmanned Aircraft Systems.

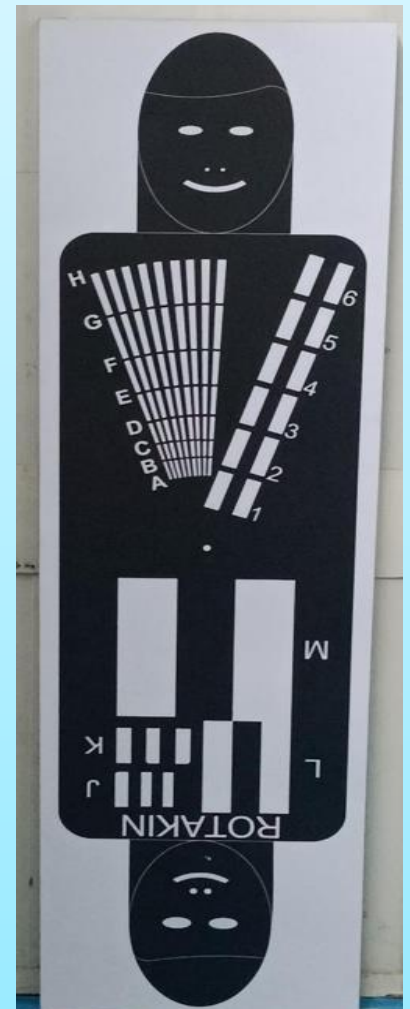


In this new role, ARAI is authorized to evaluate drone models and issue Statements of Conformity (SoC) essential for DGCA Type Certification. This move marks ARAI's significant step in positioning the organization as a central player in the evolving new mobility landscape.

❑ Development of Facility for CCTV Installation Testing as per ISO 16001:2017 (ROTAKIN MANIKIN)

ARAI has successfully developed facility for CCTV Installation Testing as per ISO 16001:2017 using Rotakin Manikin. The Rotakin Manikin plays crucial role in evaluating CCTV camera performance in Construction Equipment Vehicles (CEVs) and Mining Vehicles, in line with IS/ISO 16001:2017 requirements. This was developed by ARAI and validated as per national and international standards. It is particularly valuable for assessing image quality, field of vision, resolution, surveillance effectiveness under standardized test conditions. This tool enables precise determination of camera's ability to capture critical details such as facial features, body movements and other key aspects necessary for safety and security applications. This tool is required for two parts of tests to meet the CCTV as per ISO 16001:2017, viz. Vehicle Level Testing and Component Level Test.

In India, ARAI is currently the only testing laboratory equipped with Rotakin Manikin, reinforcing its leadership in advanced testing infrastructure. This achievement positions ARAI as a go-to facility for organizations seeking globally recognized and standardized CCTV performance validation in Construction Equipment Vehicle / Earth Moving Machinery and On Mining Vehicles and potentially for other types of CCTV validation as well.



ROTAKIN MANIKIN

❑ Facilities and Expertise for Diesel Emission Measurement in Mining Applications (Surface & Sub - Surface Level)






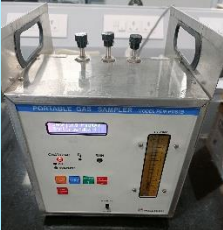

Environment Research Laboratory (ERL) of ARAI pursues research efforts aimed at mitigating negative impact of air emissions on health and environment, and leverage their potential for positive contributions towards society in the field of vehicular exhaust and ambient air quality management. ERL's mission is to conduct research on the scientific, engineering and health aspects of both particulate and gaseous air pollutants.

The tail-pipe emissions released from the heavy-duty diesel-powered vehicles used in the surface and sub-surface level mines cause occupational health concern for the people working in the mine. In the underground mines, these emissions possess serious health hazards. Monitoring and controlling these emissions at mines poses unique challenges, especially in sub-surface level due to restricted access, varying conditions due to mining activities, harsh environments, limited air exchange rates, fluctuations in ventilation, and other geographical factors. Effective monitoring of these emissions is essential to estimate the safe level health index and identify potential health risks associated with the mine operation.

Core infrastructure specific to Mining Application:

- Field and in-situ measurement capability using portable emission exhaust gas analyzers for concentration measurement of CO, CO₂, NO, NO₂, HCHO, H₂S, and O₂ directly from in-use vehicles in compliant with DGMS guidelines, enabling real-world and field-based emission characterization under actual operating conditions.
- ARAI developed portable test-rig, exclusively as per DGMS guidelines, for CO response evaluation with 1% Methane (CH₄) injection at the intake of the vehicle (Patent in-process).
- System for measurement of Diesel Particulate Matter (DPM) in the form of Elemental Carbon (EC) in compliance with the NIOSH 5040 method from stationary vehicles, along with near real-time measurement of DPM for occupational exposure assessment.

Tools & Instruments for Emission Assessment

			
CH ₄ Analyser	Multiple Portable Gas Analysers for Emission Measurement	Exposure to DPM assessment	Exposure to DPM assessment
			
ARAI Developed Test Rig for 'CO' evaluation with 1% CH ₄ Injection (Patent in-process)	Collection of PM samples on quartz filter paper for TOA/TOR analysis	Thermal Carbon Analyzer: Multi-wavelength Carbon Analyzer for EC Determination	

Emission Assessment as per DGMS Guidelines, 2018

Measurement of Undiluted Exhaust Emissions		Measurement of Exhaust Fumes (i) Full load at Max Speed (ii) No load at Normal idling		Measurement of Diesel Particulate Matter (DPM)	
Undiluted Exhaust Emissions	CO	Undiluted Exhaust Emissions	CO	Particulate Matter (EC) in $\mu\text{g}/\text{m}^3$	<ul style="list-style-type: none"> • Measurement of EC from Stationary Vehicle • Occupational exposure assessment with real time DPM
	NO		SO ₂		
	NO ₂		CO ₂		
	CO with 1% CH ₄ injection		H ₂ S		
			NO		
			Formaldehyde		
			NO ₂		

ARAI is equipped with all the required tools, advanced analytical instrumentation and facilities including ARAI developed Test Rig, to cater to the needs of emission profile assessment of these diesel vehicles under field-operational level conditions in accordance with the guidelines of Directorate General of Mines Safety (DGMS).

Comprehensive Performance and Structural Durability Evaluation for Electric Buses

Overview

Structural Dynamics Lab (SDL) of ARAI provides updated summary of Electric Bus Full-Vehicle Evaluation Program supported by advanced instrumentation, data measurement, analysis and 4-Poster Test Facility as an integrated suite. This initiative strengthens ARAI's capability to deliver end-to-end validation.

Expanded Scope of Testing

SDL is offering complete evaluation package for electric buses, covering benchmarking, ride comfort, handling characteristics, accelerated durability validation for ensuring structural adequacy using both subjective assessments and objective measurement systems.

These capabilities span full workflow from instrumentation to analysis and final validation, ensuring world-class evaluation aligned with OEM and regulatory expectations.

Instrumentation & Data Acquisition

Instruments used for real-world data collection on public roads, test tracks:

- Strain gauges for structural stress measurement and fatigue-life assessment
- Acceleration and displacement sensors for ride and vibration assessment
- Wheel-force transducers (WFT) and associated instrumentation for service load measurement
- CAN-based data logging for vehicle parameters
- High-speed, multi-channel DAQ hardware for durability load capture

The collected data supports high-fidelity simulation, road-load reconstruction and durability correlation.

Ride & Handling Evaluation (Subjective + Objective)

The ride and handling assessment combines subjective evaluation and objective measurement:

- Steering response evaluation
- Cornering, lane-change, and stability tests
- Ride comfort analysis in alignment with applicable ISO standards
- Expert driver-based subjective scoring
- Correlation of subjective feedback with objective metrics

This combined approach enables robust and quantitative assessment of passenger comfort and vehicle drivability.

Accelerated Durability Testing (ADT) Mix Finalization

Measured road loads are translated into Accelerated Durability Test (ADT) sequence that represents electric bus life cycle. The key activities include:

- Derivation of duty-cycle-specific load spectra
- Formulation of the ADT sequence to represent the target life
- Equivalence assessment between proving-ground and laboratory inputs
- Optimization to reduce test duration without compromising correlation and fidelity

The outcome is a validated, time-compressed test that simulates years of real-world usage with high confidence.

4-Poster Test Facility – Core Capabilities

4-Poster Test System enables controlled simulation of real-world vertical road inputs using four independent actuators. Key capabilities include:

- Replication of vertical dynamic loads using recorded road data
- Full-vehicle structural durability and fatigue assessment
- Suspension performance and bushing stiffness evaluation
- Ride comfort assessment under controlled inputs
- Correlation between road, proving-ground, and laboratory responses
- Validation of design improvements and countermeasures

The facility provides support for electric buses up to 12m length as well as heavy commercial vehicle platforms.

Benchmarking & Comparative Evaluation

We offer technical benchmarking and comparative evaluation across:

- Ride comfort across models
- Suspension performance mapping
- Passenger comfort index development
- Structural stress evaluation
- Vehicle dynamics and handling comparison

These insights help OEMs refine design targets and strengthen competitive positioning.

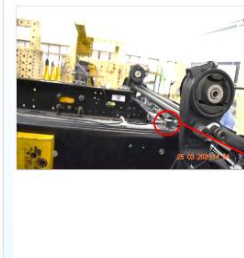
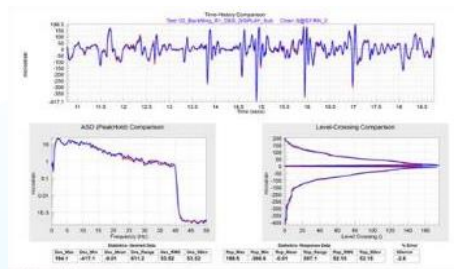
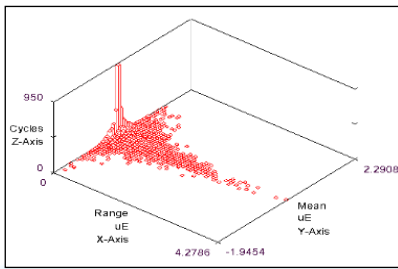
Benefits

The combined facilities and evaluation methodology deliver:

- Shorter development cycles through ADT and laboratory-based simulation testing
- Reduced dependency on prolonged on-road testing.
- Increased confidence in structural integrity, safety, and passenger comfort assessment with holistic evaluation
- Improved cross-functional collaboration across design, CAE, testing, and quality teams.

Conclusion

These testing capabilities demonstrate ARAI's commitment to delivering world-class validation services for electric bus manufacturers. This comprehensive set up at ARAI enables OEMs to achieve faster, safer and more efficient development through robust test execution and data-driven decision-making.



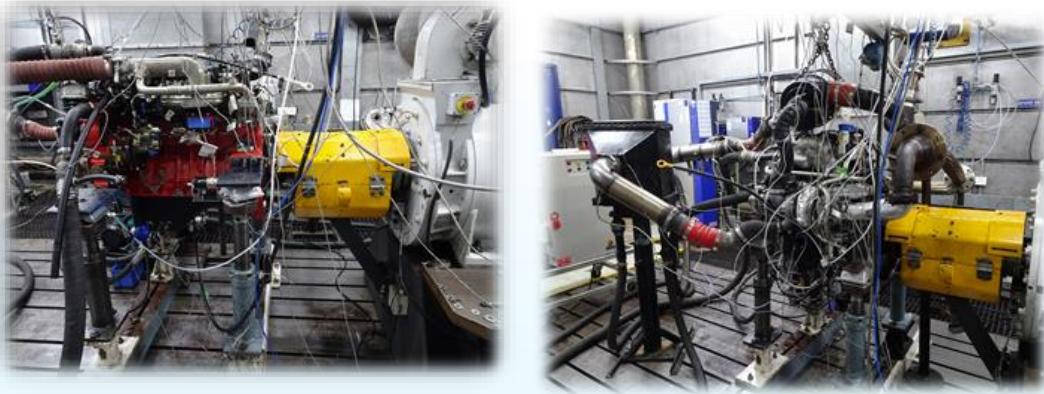
❑ **Advanced Friction Torque Testing Service for Engine Oil Optimization and Fuel Economy Improvement**

ARAI offers advanced Friction Torque Testing (FTT) service specifically designed for internal combustion engines. This new capability enables precise measurement and analysis of frictional losses in engine components across various operational conditions. Developed through comprehensive testing at ARAI, this service enables engine manufacturers, oil additive manufacturers and researchers to optimize engine efficiency, reduce wear and tear and improve fuel economy. The testing process simulates real-world operating conditions, providing valuable insights into the friction characteristics of engine parts, such as pistons, bearings and valvetrain components. By leveraging this capability, customers can enhance engine performance, extend component life and improve compliance with emissions and efficiency standards. This new capability was developed through the comprehensive development test conducted at ARAI, focusing on heavy-duty diesel engines.

In this service, ARAI meticulously measures friction torque on engine dynamometer by motoring engines at various speeds, ensuring precise control of operational parameters. The testing conditions are standardized with engine oil and coolant temperatures maintained at 50°C and 90°C respectively, or may vary as per customer-specific requirements. This rigorous approach allows accurate comparison of friction characteristics of different oil samples.

The service was validated through the project sponsored by one of the world's leading oil additive manufacturers. Total 14 candidate oils and one reference oil on two of India's most popular heavy-duty diesel engines were evaluated. The primary objective was to determine how different oils (with different additive packages) influence engine friction and, consequent fuel economy.

By leveraging this capability, manufacturers can evaluate frictional performance of specific engine oils under real-world conditions, enabling informed decisions to optimize fuel efficiency and reduce operational costs. ARAI's Friction Torque Testing service offers scientifically rigorous, repeatable and industry-relevant solution for engine oil assessment and fuel economy improvement initiatives.



Test Engine set up on Engine Dynamometer for FFT Developmental Trial

❑ Vendor Development Drive & Buyer Seller Meet

The Vendor Development Drive, organized during SIAT 2026, with a clear vision to encourage participation of MSEs and start-ups under the Make in India initiative to create fresh and diverse pool of vendors across multiple categories, received overwhelming response. The initiative aimed at strengthening indigenous capabilities while fostering long-term, mutually beneficial partnerships.

Execution & Outcome

The drive featured an easy registration process through the QR code displayed at ARAI booth in SIAT EXPO, enabling quick onboarding of interested vendors. Personal interactions at the booth allowed meaningful discussions, faster clarifications and relationship building as well as vendor development. With the encouraging response from over 125 new vendor registrations, around 60% were MSEs, that significantly expanded ARAI's vendor base. Additionally, major negotiations were successfully concluded with the suppliers and OEMs during this interactive Drive, resulting in attractive optimization of cost and lead-time.

All-in-all, the Vendor Development Drive organized by ARAI during SIAT 2026 proved to be highly impactful engagement, not only strengthening supplier relationships but also delivering measurable business benefits. Combining ease of access, direct interaction and strategic focus on MSEs and start-ups, the initiative reinforced ARAI's commitment for inclusive growth, efficient procurement and larger *Make in India* mission. The success of the drive set a strong foundation for sustained vendor collaboration and future-ready procurement practices.



Buyer–Seller Meet at SIAT 2026

The Buyer–Seller Meet organized by ARAI aimed at strengthening collaboration between industry stakeholders and promoting transparent, efficient procurement practices. It focused on encouraging adoption of e-procurement platforms such as GeM, promoting national initiatives including Make in India (MII), MSE and Atmanirbhar Bharat, creating awareness on statutory compliances, integrity and vigilance. Emphasis was also laid on key 'dos' to ensure seamless and efficient procurement process.

Execution & Outcomes

The programme witnessed active participation from shortlisted A and B class suppliers and was conducted in the dedicated acoustic hall to facilitate effective interaction. An expert speaker from the GeM portal provided valuable insights, while the session was presided over by Dr. Reji Mathai, Director – ARAI, who addressed the gathering and highlighted ARAI's vision for inclusive and transparent procurement.

Several queries related to GeM, MII and MSE were resolved and supported by presentation of relevant facts and figures. The meet also enhanced awareness on integrity and vigilance and actionable points were discussed to further streamline procurement processes. Notably, many foreign OEMs expressed keen interest in supporting the Make in India initiative. The session was attended by large number of participants, marking it as a meaningful and impactful engagement at SIAT 2026.



❑ ARAI Journal of Mobility Technology (Volume 6, Issue 1, Jan-Mar 2026)



[ARAI Journal of Mobility Technology](#) is a technical journal that focuses on automotive and related topics. It is available in ONLINE and PRINT version.

This journal was started to help professionals, researchers and students to share their research in the field of mobility technology. One of its goals is to provide appropriate platform for publishing articles on variety of automotive and allied subjects. Papers published in this journal are well-promoted in the automotive and research communities.

The journal welcomes contributions from researchers all over the world as well as from scholars, academics and professionals in the automotive industry.

The 1st edition of the journal for year 2026 (**Volume 6, Issue 1, Jan-Mar 2026**) has been released online. For more details, you can visit journal's website, viz. <https://araijournal.com/index.php/arai> .

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