Online: ISSN: 2583-3707
Volume 3, Issue 4, October–December, 2023

Date of Publication: 1st October 2023
Owned by: Automotive Research Association of India
Acronym: AJMT
Language of Publication: English
Periodicity: Quarterly (Jan, Apr, Jul, Oct)
Subject: Engineering (Automotive)
Started Year: 2021 (Oct-Dec)
Publication Nature: Print & Online
Website: https://araijournal.com/index.php/arai
Email: journal.pub@araiindia.com
© ARAI, Pune

Printed by: Mr. KAMLESH KUMAR VIJAYVARGIYA
Published by: Mr N. B. DHANDE

On behalf of the owner AUTOMOTIVE RESEARCH ASSOCIATION OF INDIA (ARAI), Pune Maharashtra printed at Aditya Offset Process (I) Pvt. Ltd., H. No. #3-1/7, Survey No. 56/1, Jalpally Village, Saroornagar (Mandal), Ranga Reddy (Dist), Hyderabad and published from AUTOMOTIVE RESEARCH ASSOCIATION OF INDIA, Survey No. 102, Vetal Hill, Off Paud Road, Kothrud, Pune - 411038, Maharashtra, India.

No part of this publication may be reproduced stored or transmitted in any material form or by any means (including electronic, mechanical, photocopying, recording or otherwise) without the publisher’s prior written permission.

Annual Subscription
Degree Offering College / University: INR 5000 / USD 100
Corporate/Individual / R&D Institute / Government Institute: INR 8000 / USD 200
Contact for Subscription:
Mr. Nikunjesh Shah
Subscription and Marketing Head, 4-4-309/306, Sultan Bazar, Bank Street Hyd-500095, Telangana.
Mob:+91-8374105220
Email:nikunjesh.shah@bspbooks.net

Editor-in-Chief
Dr. S.S. Thipse
Sr. Deputy Director - ARAI
Pune - Maharashtra

Associate Editor
Dr. B.V. Shamsundara
Deputy Director - ARAI
Pune - Maharashtra

Assistant Editor
Dr A. Madhava Rao
Manager - ARAI
Pune - Maharashtra
ADVISORY BOARD MEMBERS

Dr. Reji Mathai (Chairman)
Director – ARAI
The Automotive Research Association of India, Pune – Maharashtra, India

Dr. S.S.V. Ramakumar
Director (R&D) and Board Member
Indian Oil Corporation, Faridabad, India

Mr Rajendra Petkar
President / Chief Technology Officer
Tata Motors Limited, Pune – Maharashtra, India

Prof. Anil Sahasrabudhe
Chairman – NETF
Nelson Mandela Marg, Vasant Kunj, New Delhi

Mr Arindam Lahiri
Chief Executive Officer
Automotive Skills Development Council (ASDC), New Delhi, India

Dr N. T. Rao
Vice Chancellor
Chandigarh University, Mohali, Punjab, India

Dr Jabez Dhinagar
Senior Vice President – Vehicle Engineering
Ola Electric, 17th Main, 100 Feet Road, Koramangala, Bengaluru, Karnataka

Dr Ramesh, A.
Institute Chair Professor
Indian Institute of Technology-Madras, Chennai, India

Prof. Anindya Deb
Professor
Indian Institute of Science (IISc), Bangalore – Karnataka, India

Dr Anuradda Ganesh
Chief Technical Advisor and Director
Cummins Technologies India Pvt Ltd., Pune & Emeritus Professor, IIT-B, Mumbai – Maharashtra, India

Registered Address
The Automotive Research Association of India (ARAI)
Survey No. 102, Vetal Hill, off Paud Road, Kothrud, Pune-411038, Maharashtra, India.
Publisher Contact: (020)-3023-1130, Email: dhande.dts@araiindia.com
Editor Contact: (020)-3023-1434, Email: thipse.edl@araiindia.com

Disclaimer: The publisher, editor(s), or any editorial or advisory board members are not responsible for the accuracy of the content, author statements, expressed opinions, or data in this journal. The authors are solely responsible for the contents published in the paper.
EDITORIAL BOARD MEMBERS

- Dr. Abhijeet Marathe – General Manager - Automotive Research Association of India, Pune
- Dr. Akella Sharma – Vice President - Automotive Sector - Mahindra & Mahindra Limited, Chennai
- Dr. Amala Justus Selvam – Professor - Vel Tech University, Chennai
- Dr. Arun Jaura – Chief Technology Officer - Hero MotoCorp, Jaipur
- Dr. B. Ashok – Associate Professor - VIT University, Vellore
- Dr. B. S. Kothavale – Professor - Dr Vishwanath Karad MIT World Peace University, Pune
- Dr. Ganesh Kakandikar – Professor - Dr. Vishwanath Karad MIT World Peace University, Pune
- Dr. K. C. Vora – Emeritus Professor - College of Engineering Pune (CoEP), Pune
- Dr. M. Suresh – Assistant Professor - Karunya Institute of Technology and Sciences, Coimbatore
- Dr. Mohan Godse – Proprietor - U 2 I, Pune
- Dr. Mohd Rafiq B. Agrewale – Manager - Automotive Research Association of India, Pune
- Dr. Nagesh H. Walke – Sr. Deputy Director - Automotive Research Association of India, Pune
- Dr. P A Lakshminarayanan – Former - Technical Advisor - Simpson & Co. Ltd., Chennai
- Dr. P. P. Chattaraj – Additional Director - National Automotive Testing and R&D Infrastructure Project (NATRiP), Pithampur
- Dr. P. R. Pawar – Deputy Director - Automotive Research Association of India, Pune
- Dr. P.K. Ajeet Babu – Manager - Automotive Research Association of India, Pune
- Dr. R Basargekar – Technical Director - APPL Industries, Pune
- Dr. Rashmi R – Dean & Associate Professor - Padmabhooshan Vasantdada Patil Institute of Technology (PVPIT), Pune
- Dr. Ravindra Utgikar – Vice President - Praj Industries Ltd., Pune
- Dr. Sanjay A Patil – General Manager - Automotive Research Association of India, Pune
- Dr. S R Marathe – Consultant - Engineering Consultant, Pune
- Dr. S.A. Mohan Krishna – Associate Professor - Vidyavradhaka College of Engineering, Mysuru
- Dr. Sanjay Arole – Director - Automotive Materials & Manufacturing Engineering Services, Pune
- Dr. Sanjay D. Yadav – Professor - Rajarambapu Institute of Technology, Sangli
- Dr. Sarit Kumar Das – Institute Chair Professor - Indian Institute of Technology-Madras, Tamil Nadu
- Dr. Satyam Sahay – John Deere Fellow - John Deere Technology Centre India, Pune
- Dr. Senthil Muthu Kumar Thiagamani – Associate Professor - Kalasalingam Academy of Research and Education, Tamil Nadu
- Dr. Sharada Vikram Chougule – Professor - Finolex Academy of Management and Technology, Ratnagiri
- Dr. Shivprakash Barve – Professor - Dr. Vishwanath Karad MIT World Peace University, Pune
- Dr. Simhachalam D. Jutlu – General Manager - Automotive Research Association of India, Pune
- Dr. Srinivas Gunti – Head - Talent Development, General Manager - Tata Passenger Electric Mobility Limited, Pune
- Dr. Sundarapandian Vaidyanathan – Professor - Vel-Tech University, Chennai
- Dr. Sushil S. Ramdas – Deputy Director - Automotive Research Association of India, Pune
- Dr. Vijay Narkhede – Senior Manager (R&D) - Süd-Chemie India, Gujarat
- Dr. Y.K. Bhateshwar – Faculty - Automotive Research Association of India, Pune
EDITORIAL BOARD MEMBERS (Cont.)

• Dr. Yogesh Aghav – Head-Advanced Technologies - Kirloskar Oil Engines Limited, Pune
• Mr. A. A. Gaikwad – General Manager - Automotive Research Association of India, Pune
• Mr. Ashwin Subramanian – AGM-e mobility propulsion systems - Stellantis, PCA Motors Pvt. Ltd., Chennai
• Mr. Atul Pol – Program Manager - Tata Technologies, Pune
• Mr. Ayush Maheshwari – Researcher - Akar International, Singapore
• Mr. Devendra Mandke – Technical Specialist - JOHN DEERE INDIA PRIVATE LIMITED, Pune
• Mr. Karthik Kaliappan – Sr. Manager - John Deere Equip. Pvt. Ltd., Shikrapur
• Mr. Mahadevan Pichandi – Head-Vehicle Engineering - Mahindra Electric Mobility Limited, Bangalore
• Mr. Mahesh Masurkar – Chief Manager - John Deere India Pvt Ltd., Pune
• Mr. Moqtik Bawase – General Manager - Automotive Research Association of India, Pune
• Mr. Pradeep Chandrasekaran – Associate Director - Ola Electric Mobility Pvt. Ltd., Bangalore
• Mr. Prakash, V. Sardeai - Head, Application Engg & Business Development - Sud-chemie-India-Pvt Ltd., Gujarat
• Mr. Prashant Mahale – Asst. General Manager - Fiat Chrysler, Mumbai
• Mr. R M Cursetji – Head-Technology Department - Sud-Chemie India Pvt. Ltd., Gujarat
• Mr. Rahul Mahajan – Deputy Director - Automotive Research Association of India, Pune
• Mr. S. B. Sonawane – Manager - Automotive Research Association of India, Pune
• Mr. Sakthivel V – Chief General Manager - IndianOil Corporation Limited, Chennai
• Mr. Sanjay Deshpande – Vice President - Mahindra & Mahindra, Nasik
• Mr. Srivivasan Raju – Consultant - Automotive Consultant, Pune
• Mr. Swaranpanand Sewalkar – Sr. Technology Lead - JOHN DEERE INDIA PRIVATE LIMITED, Pune
• Mr. T.C. Kamath – Deputy General Manager - Design Standards MRF Limited, Chennai
• Mr. Umesh Sawant – Chief Operating Officer - Pi Green Innovations Pvt. Ltd., Pune
• Mr. Vikram A. Tandon – General Manager - Automotive Research Association of India, Pune
• Mr. Vinay Mundada – Consultant - Engineering Consultant, Pune
• Mr. Vinit Jawale – Systems Engineering Leader - JOHN DEERE INDIA PRIVATE LIMITED, Pune
• Mr. Yogesh Thipse – General Manager - Automotive Research Association of India, Pune
• Mr. Z. A. Mujawar – Consultant - Engineering Consultant, Pune
• Mrs. Beena Sandeep Limkar – Assistant Professor - Savitribai Phule Pune University, Pune
• Mrs. Swati Athavale – Consultant - Engineering Consultant - Pune
• Ms. Jyoti Kirve – Deputy Director - Automotive Research Association of India, Pune
CONTENTS

Editorial

Dr S.S. Thipse

Research Papers

- Retrofitting of an Existing Garbage Tipper Truck with an Electric Powertrain and its Renewable Charging Station Concept Based on On-Grid Solar Charging
  Utkarsh Gadkari .............................................................................................................. 763

- Algorithm based Calibration Strategies in an Electric Powertrain
  Siddharth R Gandhi, and Abhijeet Chavan ............................................................................ 774

- Predicting base Engine Vibrations using Flexible Multi Body Dynamics Simulation
  Pranay Sharma, Nikhil Rao, Rentong Wang and Pravin Kakde ........................................................... 788

- Numerical Analysis and Experimental Validation of Temperature Induced Creep and Fatigue life of Inconel 740H and Haynes 282
  Ramakrishnan. P.A and Ajith Ramesh ............................................................................................... 803

- Study on Various Position Sensing Technologies in Tractor Hitch Application
  Sandeep, T., Koparde Prashant, Hingne Abhijit, Sewalkar Swarupanand and Hallale Sanjeev .......... 820

- Experimental Assessment of Genset Performance for PCCI-DI Combustion Engine
  Hemant A. Kinikar, A.B. Kanase-Patil and Tushar A. Jadhav .......................................................... 835

- Comparative Performance Assessment of Sizing of Electric Motor through Analytical Approach for Electric Vehicle Application
  Shweta S Suryavanshi, Sagar R Wankhede, Pravin M. Ghanegaonkar and Ganesh K. Jadhav ........... 842

- Field Programmable Functional Safety Mechanisms Implementation using FPGA
  Priyank Sharma ........................................................................................................................................ 856

- Impact of Fused Deposition Modeling Process Parameters and Heat Treatment on Mechanical Characteristics and Product Quality: A Review
  Mohd Yousuf Ali, G. Krishna Mohana Rao and B. Anjaneya Prasad .................................................. 883

- Accelerated Life Prediction of Automotive Elastomers using Thermo-Gravimetric Analysis
  Moqtik Bawase, Sushil Chaudhari and Dr. S. S. Thipse ........................................................................ 913

Editor-in-Chief: Dr S.S. Thipse
In the rapidly evolving landscape of mobility technology, the ARAI Journal of Mobility Technology takes pride in presenting its Oct–Dec 2023 issue—a testament to the relentless pursuit of innovation and excellence within the automotive realm.

The world is at a pivotal juncture, demanding sustainable solutions to mitigate the environmental impact of transportation. This journal delves into ground-breaking advancements in electric and hybrid vehicles, shedding light on technological strides that promise to reshape the future of mobility. As we stand on the brink of a cleaner, greener era, the ARAI Journal is your guide to understanding and embracing sustainable mobility.

Autonomous vehicles have transitioned from fiction to reality, and this journal explores the latest breakthroughs in autonomous driving technology. From cutting-edge sensor systems to artificial intelligence algorithms, discover how researchers and engineers are propelling us toward a future where vehicles navigate with unparalleled precision, safety, and efficiency.

The digital revolution has transformed the automotive industry. With the advent of 5G and beyond, this journal explores the transformative impact of connectivity on vehicles. From smart infrastructure to advanced driver-assistance systems, discover how the fusion of technology and automotive engineering is creating a connected ecosystem that enhances the driving experience and ensures unprecedented levels of safety.

Innovation is not without its challenges, and this journal candidly addresses the hurdles faced by the mobility technology sector. From regulatory considerations to cybersecurity concerns, our editorial team examines the complexities that accompany progress, providing insightful perspectives on navigating the intricate landscape of modern automotive development.

The issue shines a spotlight on ground-breaking research and development initiatives. Whether it is materials engineering for lightweight or the exploration of alternative fuel sources, the ARAI Journal is your gateway to the latest discoveries and advancements driving the automotive industry forward.

As we embark on a new era of mobility, this issue of the ARAI Journal of Mobility Technology serves as a compass, guiding industry professionals, researchers, and enthusiasts through the dynamic landscape of technological innovation. Together, let us embrace the challenges, celebrate the successes, and collectively steer the course toward a future where mobility is not just a means of transportation but a catalyst for positive global change.