Safer, Greener and Quieter Environment

ARAI

Progress through Research

45th ANNUAL REPORT
2014-2015

ARAI

Progress through Research

VISION

ARAI has a strong base of state-of-the-art technology equipment, laboratory facilities and highly qualified and experienced personnel. With these assets, ARAI has goals, strategies and action plans to achieve fullest customer satisfaction. These are:-

(a) to compete in service with excellence

(b) to obtain recognition and accreditation

(c) to cover global market

(d) to build commitment of all personnel

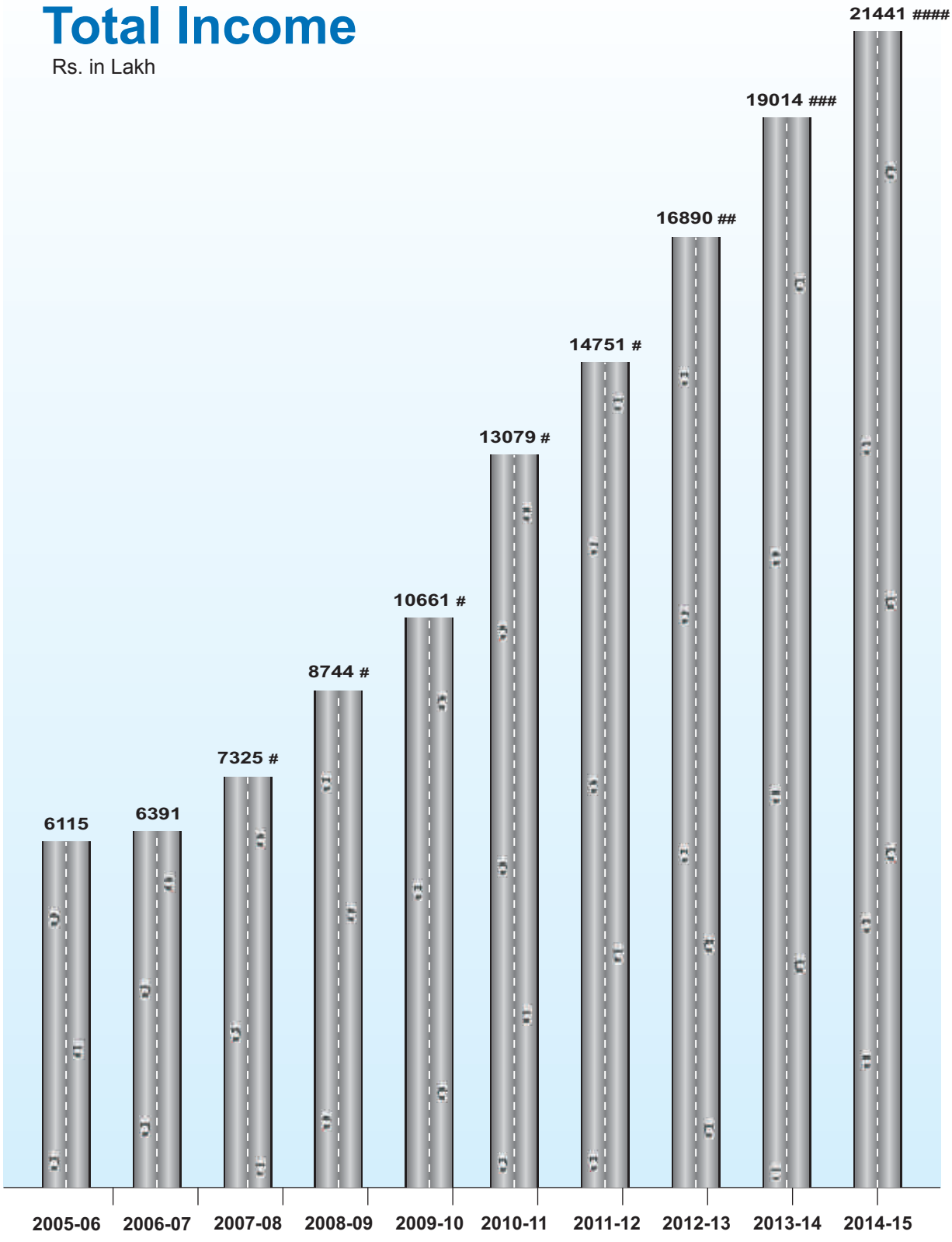
(e) to develop team spirit and sense of belonging amongst all.

MISSION

- ARAI has been providing various services to the Indian Automotive Industry in the areas of design & development and know-how for manufacture & testing of components/ systems to national/ international standards. ARAI shall strive to achieve international recognition in these areas.
- ARAI shall seek valuable guidance and support from our members, from time to time to achieve growth and stability.
- With the globalisation of economy and business, ARAI shall enlarge its scope of services to meet the requirements of automotive industries anywhere in the world.
- ARAI strongly believes that satisfaction of customer needs on continuing basis, is of prime importance to earn loyalty of customers. Therefore, emphasis shall be on meeting and exceeding customer needs through continuing quality improvement with active participation of employees and also customers.

Total Income

Rs. in Lakh



Excluding Interest on earmarked fund transferred to respective fund and fund transferred from R & D reserve fund.
Excluding Interest on earmarked fund transferred to respective fund Rs. 2353 lakhs and fund transferred from R & D reserve fund Rs. 48 lakhs.
Excluding Interest on earmarked fund transferred to respective fund Rs. 2774 lakhs and fund transferred from R & D reserve fund Rs. 34 lakhs.
Excluding Interest on earmarked fund transferred to respective fund Rs. 2253 lakhs and fund transferred from R & D reserve fund Rs. 81 lakhs.

ARAI
Progress through Research

45th ANNUAL REPORT
2014-2015

Highlights of the year

1. Over 9.3% YoY growth in Operational Income (OI)
2. 57% of OI contributed by Non-certification business
3. Conventional SCV successfully converted to an Electric Vehicle
4. Launch of 'MARG – Measurement & Analysis of Road Geometry' database containing digitized 3D road profile of Indian roads
5. State-of-the-art Crash Test facilities installed under NATRiP at Chakan
6. Facilitating establishment of six Inspection & Certification (I&C) Centres across six states
7. Symposium on International Automotive Technology (SIAT 2015) and SIAT Expo 2015 organized successfully

Governing Council Members of ARAI : 2014-15

PRESIDENT	**Mr. Vinod K Dasari, Managing Director, Ashok Leyland Ltd.**
VICE PRESIDENT	**Mr. Rajan Wadhera, President and Chief Executive, Truck & Powertrain Division, Head – Mahindra Research Valley, Member of the Group Executive Board, Mahindra & Mahindra Ltd.**
DIRECTOR	**Mrs. Rashmi Urdhwareshe**

MEMBERS

1 Ashok Leyland Ltd.
2 Bajaj Auto Ltd.
3 Bosch Ltd.
4 Cummins India Ltd.
5 Eicher Motors Ltd.
6 Fiat India Automobiles Pvt. Ltd.
7 Force Motors Ltd.
8 General Motors India Pvt. Ltd.
9 Honda Cars India Ltd.
10 Hyundai Motor India Ltd.
11 JCBL Ltd.
12 Kirloskar Oil Engines Ltd.
13 Mahindra & Mahindra Ltd.
14 Maruti Suzuki India Ltd.
15 Piaggio Vehicles Pvt Ltd.
16 Simpson & Co. Ltd.
17 SML Isuzu Ltd.
18 Tata Cummins Pvt. Ltd.
19 Tata Motors Ltd.
20 Toyota Kirloskar Motor Pvt. Ltd.
21 TVS Motor Co. Ltd.
22 VE Commercial Vehicles Ltd.
23 Volkswagen India Pvt. Ltd.
24 Volvo India Pvt. Ltd.

GOVT. OF INDIA REPRESENTATIVES

Mr. Ambuj Sharma,
Additional Secretary,
Govt. of India
Ministry of Heavy Industries & Public Enterprises
Department of Heavy Industry
Udyog Bhavan, New Delhi 110 011

Mr. A. M. Manichan,
Deputy Secretary
Govt. of India
Ministry of Heavy Industries & Public Enterprises
Department of Heavy Industry
Udyog Bhavan, New Delhi 110 011

Mr. Sushil Lakra,
Industrial Adviser,
Govt. of India
Ministry of Heavy Industries & Public Enterprises
Department of Heavy Industry
Udyog Bhavan, New Delhi 110 011

INVITEES

- Society of Indian Automobile Manufacturers
- Automotive Component Manufacturers Association of India
- Tractor Manufacturers Association
- National Automotive Testing and R&D Infrastructure Project

SECRETARY TO THE GOVERNING COUNCIL

Mrs. Prajakta M. Dhere

OFFICE

Survey No. 102, Vetal Hill, Off Paud Road, Kothrud,
Pune 411 038, Maharashtra, INDIA
Phone : 91-20-3023 1111, 3023 1200
Fax : 91-20-3023 1104
Email : director@araiindia.com

BANKERS

- Bank of Baroda
- HDFC Bank Ltd.

STATUS OF INSTITUTE

Registered under
The Societies Registration Act,
XXI of 1860 Regn. No. 133/66
GBBSD dated 10.12.1966

AUDITORS

M/s. A. R. Sulakhe & Co.
Chartered Accountants
Head Office :
Anand Apartment, 1180/2, Shivajinagar, Pune 411 005

ARAI Members : 2014-15

1 Ashok Leyland Ltd.
2 AMW Motors Ltd.
3 Atul Auto Ltd.
4 A.J. Auto Pvt. Ltd.
5 Bajaj Auto Ltd.
6 Behr-Hella Thermocontrol (India) Pvt. Ltd.
7 Bharat Forge Ltd.
8 Bharat Seats Ltd.
9 Bosch Limited
10 Brakes India Ltd.
11 Cummins India Ltd.
12 Cummins Technologies India Pvt. Ltd.
13 Delphi-TVS Diesel Systems Ltd.
14 Eicher Motors Ltd.
15 Enginetech Systems Pvt. Ltd.
16 Fiat India Automobiles Pvt. Ltd.
17 Force Motors Ltd.
18 Ford India Pvt. Ltd.
19 F P Seating Systems Pvt. Ltd.
20 General Motors India Pvt. Ltd.
21 Greaves Cotton Ltd.
22 Hero Electric Vehicles Pvt. Ltd.
23 Hindustan Motors Ltd.
24 Honda Cars India Ltd.
25 Hyundai Motor India Ltd.
26 International Cars and Motors Ltd.
27 JCBL Ltd.
28 Johnson Controls Automotive Ltd.
29 Kanda Auto Pvt. Ltd.
30 Kirloskar Oil Engines Ltd.
31 KSS Abhishek Safety Systems Pvt. Ltd. *
32 Lear Automotive India Pvt. Ltd.
33 Lombardini India Pvt. Ltd.
34 Madras Engineering Industries Pvt. Ltd.
35 MM Auto Industries Ltd.
36 Mahindra Gujarat Tractor Ltd.
37 Mahindra & Mahindra Ltd.
38 Mahindra Reva Electric Vehicles Pvt. Ltd.
39 Man Trucks India Pvt. Ltd.
40 Mansons Automotive Rubber Pvt. Ltd.
41 Maruti Suzuki India Ltd.
42 Mercedes-Benz India Pvt. Ltd.
43 MLR Motors Ltd.
44 MSKH Seating Systems India (P) Ltd.
45 Piaggio Vehicles Pvt. Ltd.
46 P M Diesels Pvt. Ltd.
47 Power Electronics *
48 Premier Ltd.
49 Randhawa Automobile Engineering Pvt. Ltd.
50 Rinder India Pvt. Ltd.
51 Rocket Engineering Corporation Pvt. Ltd.
52 Rohan BRC Gas Equipment Pvt. Ltd.
53 Rotary Electronics Pvt. Ltd.
54 Scooters India Ltd.
55 Simpson & Co. Ltd.
56 Skoda Auto India Pvt. Ltd.
57 S. M. Auto Engineering Pvt. Ltd.
58 SML Isuzu Ltd.
59 Spaco Technologies (India) Pvt. Ltd.
60 Sri Ramdas Motor Transport Ltd.
61 Tata Cummins Pvt. Ltd.
62 Tata Motors Ltd.
63 Toyota Kirloskar Motor Pvt. Ltd.
64 Tractors and Farm Equipment Ltd. *
65 TVS Motor Co. Ltd.
66 Ucal Products Pvt. Ltd.
67 Vanaz Engineers Ltd.
68 Varroc Lighting Systems (India) Pvt. Ltd.
69 VE Commercial Vehicles Ltd.
70 Virama Laminates Pvt. Ltd.
71 Volvo India Pvt. Ltd.
72 Volkswagen India Pvt. Ltd.
73 WABCO India Ltd.
74 Wheels India Ltd.

* Granted membership during the year 2014-15

Committees of ARAI : 2014-15

Finance & Internal Audit Committee

CHAIRMAN

Mr. Rajan Wadhera
Vice President – ARAI,
President and Chief Executive, Truck & Powertrain Division,
Head – Mahindra Research Valley, Member of the Group Executive Board, Mahindra & Mahindra Ltd

MEMBERS

Mr. N. D. Pathak
Chairman & Managing Director,
Spaco Technologies (India) Pvt Ltd

Mr. Suhas Kadlaskar
Vice President-Corporate Affairs
& Human Resources,
Mercedes-Benz India Pvt Ltd.

Mr. T. Vinodkumar
CFO,
Kirloskar Oil Engines Ltd

Mr. Venugopal P. Rao
Head – (NPI-CVBU Business Planning),
Tata Motors Ltd

Mr. Kausik Basu,
DGM-Accounting,
Volkswagen India Private Limited

Mr. Gajanan Chinchwadkar,
Sr. General Manager - F&A
Mahindra & Mahindra Ltd,

Mr. A.M. Manichan,
Dy. Secretary,
Govt of India,
Ministry of Heavy Industries & Public Enterprises,
Dept. of Heavy Industry

Mr. Nitin Gokarn,
CEO & Project Director,
National Automotive Testing and R&D Infrastructure Project (NATRiP)

Mrs. Rashmi Urdhwareshe
Director-ARAI

Project Evaluation & Monitoring Committee

CHAIRMAN

Mr. Jayanta Kumar Deb
Sr Vice President
Head – Product Development (Automotive Sector), Mahindra & Mahindra Ltd

MEMBERS

Mr. R. S. Sachdeva,
Executive Vice President and
Head - Technology,
VE Commercial Vehicles Ltd

Mr. I. V. Rao,
Executive Adviser,
Maruti Suzuki India Ltd

Mr. S. Janardhanan,
Vice President (Co-ordination)
Simpson & Co. Ltd

Mr. M. N. Muralikrishna
Technical Adviser
TVS Motor Co. Ltd

Mr. Vinay Harne,
President (NPD)
TVS Motor Co.Ltd

Mr. T. C. Gopalan
Chairman (Technical Committee)
Tractor Manufacturers Association

Mr. Vijay Damodaran,
Engineering Chief,
General Motors India Pvt Ltd

Mr. Michael Poznanski Eisenschmidt,
Technical Head,
Volkswagen India Pvt Ltd

Mr. Aniruddha Kulkarni,
Chief Technology Officer,
Force Motors Ltd

Mr. Sushil Lakra,
Industrial Advisor,
Govt. of India,
Ministry of Heavy Industries &
Public Enterprises,
Dept. of Heavy Industry

Mr. Nitin Gokarn,
CEO & Project Director,
National Automotive Testing and
R & D Infrastructure Project (NATRiP)

Mrs. Rashmi Urdhwareshe
Director-ARAI

Mr. D. J. Kulkarni,
Sr. Dy. Director - ARAI

Mr. S. C. Gadgil,
Dy. Manager, ARAI,
Member Secretary, PEMC of ARAI

Mr. Vinod Dasari
President

President's Statement

Mr. Rajan Wadhera
Vice President

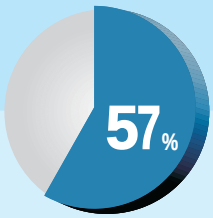
9.3%
growth in Operational Income

Dear Members,

I am delighted to present our Annual Report for the Financial Year 2014-15, which has been another year of successful performance. In order to achieve the planned trajectory of growth, we had articulated a cohesive direction, resulting in a steady growth of over **9.3%.** We have built on our earlier years' foundation and posted **Operational Income of over Rs. 187** crore in FY 2014–15. One of the most exciting developments over the last few years has been increase in the **share of Non-certification income, which now accounts for about 57% of our Operational Income.** This success stems from the excellent human intellect we have, and also our dedicated focus on research and quality.

"... success stems from the excellent human intellect we have"

57% of our Operational Income from Non-certification business



Focus on R&D

We continued to expand our service portfolio with the help of capability enhancements, arising out of our research programs. The year has seen several notable developments in the area of research projects undertaken. We successfully completed two internally funded projects – Development of GDI (Gasoline Direct Injection) ECU control strategies and Generation of 3D Road Profile database. We have also successfully built a prototype of electric vehicle from a conventional intra-city public transport SCV and a transmission for LCV application.

In case of projects funded by Department of Heavy Industry (DHI), we have been awarded two projects, in addition to the two ongoing ones. These projects are on 'Studying material compatibility and emission performance with Ethanol blended Gasoline (E20)'; and 'Development of lightweight forging processes for automotive components'. These projects are in-line with the national objective of energy security for the country.

- GDI ECU control strategies
- Generation of 3D Road Profile database
- Electric vehicle built out of a conventional SCV

Taking our research program further, we finalized a well-structured R&D Technology Roadmap to strengthen our research and innovation capabilities and to deliver significant value in the future. Under this roadmap, two core research areas, viz. light weighting, and hybrid electric vehicle technology have been identified. Eight projects under this roadmap have been taken up for implementation this year.

R&D Technology Roadmap to strengthen our research and innovation capabilities

Creation of new facilities

Investing in technology and infrastructure has been another focus area during this year. Establishment of new facilities and comprehensive upgradation under NATRiP at our new centre at Chakan along with homologation facilities for Passive Safety (which includes full vehicle crash systems) will help in meeting future requirements of the automotive industry. This expansion will facilitate creating Centres of Excellence in Powertrain, Fatigue and Materials.

163 **Automotive Industry Standards published till date**

Contributions in creation of new safety standards

We provide secretariat services to 'Automotive Industry Standards Committee (AISC) and contribute towards formulation and harmonization of standards. This year, fourteen standards have been released, taking the total standards published till date to 163 covering wide range of subjects for different categories of motor vehicles.

Skill Development and ARAI Academy

Knowledge dissemination is one aspect which is deeply embedded in us. Our training and educational programs are for enhancing skills of working professionals and budding engineers. This year, we organized 40 Proficiency Improvement Programs and 2 Domain Training Programs for industry personnel. We also offer Ph. D., M. Tech, M. S. and B. Tech. programs in various automotive disciplines through our collaborations with various universities.

Nothing has a greater impact on our long-term success than the creativity, talent, and commitment of our own people. So, we continue to focus on sustained development of our human resource. Enhancement of technical, behavioural and management skills was the focus during this year.

SIAT 2015

The fourteenth edition of 'Symposium on International Automotive Technology' (SIAT 2015) was successfully organized in association with SAEINDIA, NATRiP and SAE International (USA). This symposium witnessed a participation of over 1500 delegates from 25 countries and its theme – "Towards Safer, Cleaner & Quieter World" was very much apt in the current scenario.

Successful organizing of

Corporate Social Responsibility

We continue to demonstrate our unwavering commitment towards our communities by committing our resources and energies to social development. This year, we have extended financial support to six projects undertaken by organizations working for empowerment of underprivileged in the areas of education and health.

Mission of advancement of automotive technology to create safer, cleaner and affordable mobility solutions

Key drivers for sustaining growth

We have been building on our strengths, enhancing capabilities, promoting spirit of innovation in operations, investing in facilities, expanding reach and nurturing human resource. All of these have contributed significantly in sustaining the growth momentum. The thinking behind these initiatives has been that we remain in constant pursuit of our mission of advancement of automotive technology to create safer, cleaner and affordable mobility solutions. We are seeing a steady and consistent growth in global business over the last few years, enabling us to establish ourselves in the global market. I am confident with our zeal and endeavor; we are not very far from achieving our vision of being a global R&D organization.

In conclusion, I would like to sincerely thank the Members of the Governing Council; Department of Heavy Industry (DHI); the Chairman and Members of Project Evaluation & Monitoring Committee; the Chairman and Members of Finance & Internal Audit Committee; and ARAI Members for their strong support. Excellence in the services through strong governance has always been our forte. I would also like to thank our customers and associates. Most importantly, I congratulate Director and all ARAI employees for their exemplary contributions and commitment towards the growth of ARAI.

Vinod Dasari

Mrs. Rashmi Urdhwareshe
Director

Director's Report

The Governing Council of ARAI has great pleasure in presenting the Annual Report along with Technical Report and Audited Statement of Accounts for the year ending 31st March 2015.

At ARAI, we strongly believe that a comprehensive strategy of leading to win; growing talent and teams; and proactively competing and connecting with external environment; provides competitive edge to create shared value for our stakeholders and the society. Looking back at the progress and achievements of this year, it is heartening to inform that our strategic decisions are indeed facilitating sustained growth in this competitive environment.

Our Operational Income grew by over 9.3% this year, with non-certification business accounting for about 57% of this income. Also, our research projects are yielding results in the form of new competencies, new service additions and commercialization of the outcomes.

We have embarked on our ambitious R&D Technology Roadmap with two areas for research – light weighting and hybrid electric vehicle technology. This year, we initiated implementation of eight projects under this roadmap, thereby acquiring new competencies and creating avenues of business. On the Homologation front, we continue to gain strength with every passing year with our customers reposing faith in us. I am confident that with upcoming laboratories under NATRiP at Chakan becoming operational in the near future, we will be in a position to take up many more challenges. I am happy to report that the facility establishment activity at the new site is nearing completion now. Also, looking at our future expansion plans, we have acquired about 95 acres of land at Takawe near Pune.

> **"We continue to gain strength with every passing year with our customers reposing faith in us."**

I believe that with new facilities in place and with development of newer skills & services from our projects, we will emerge much stronger in the competitive global world. ARAI's aspiration to serve global automotive industry is no more a dream, but a glorious reality. Strengthening quality of our services was our top priority during this year and we remain committed to provide quality and affordable solutions to our customers. ARAI is, and shall always remain an organization that is trusted and highly respected.

> **"ARAI's aspiration to serve global automotive industry is no more a dream, but a glorious reality."**

As we will enter our Golden Jubilee year in December 2015, Team ARAI shall always remain thankful to all our stakeholders for their continued support, guidance and confidence in us.

On behalf of Team ARAI, I would like to thank the President, Vice President, Members of the Governing Council and Senior Officials from the Department of Heavy Industry for their encouragement and support.

Mrs. Rashmi Urdhwareshe

OPERATIONAL HIGHLIGHTS

Finance & Accounts

The Income & Expenditure Account, Balance Sheet and Auditor's Report are presented herewith.

- **Financial performance**

  ARAI has continued to show excellent performance during the Financial Year 2014-15. The Income Target has been achieved and Operational Income has gone up by 9.35%% to Rs. 18,731 lakh in 2014-15 as compared to Rs. 17129 lakh in 2013-2014. The Total Income, including Membership Subscriptions, Interest, etc. has reached a figure of Rs. 23694 lakh (excluding funds transferred from R&D reserve fund) as compared to Rs. 21788 lakh of last year. All this had been possible due to several measures undertaken in overall ARAI governance, in various areas such as finance, purchase, invoicing procedure, time management, productivity, competence building and Human Resource Development etc.

- **Investment of funds**

  The cash assets available with ARAI have been invested in Scheduled Banks / Financial Institutions in various Deposit Schemes as per Government guidelines and Savings Bank Accounts.

- **DHI Supported Projects**

  Projects approved by the Cess Committee are funded by Department of Heavy Industry (DHI), Ministry of Heavy Industries & Public Enterprises (MHI&PE), Government of India; out of Automobile Cess funds. ARAI has taken up R&D projects funded from its internal funds.

- **Appointment of Statutory Auditors**

  M/s A.R. Sulakhe & Company, Chartered Accountants, Pune were appointed as Statutory Auditors for the year 2014-2015 in the Annual General Meeting held on 11th September 2014.

- **Membership Subscription**

  The total number of members of ARAI as on 31/3/2015 is 74 and the Annual Membership Subscription for the year under report is Rs. 408.97 lakh.

- **Recognition by DSIR**

  The Department of Scientific & Industrial Research, Ministry of Science & Technology, Govt. of India, has renewed recognition to ARAI as a Scientific and industrial Research Organization (SIRO) for further period from 01-04-2014 to 31-03-2017.

- **Credit rating**

  The rating on the bank facilities of ARAI has been reaffirmed at CRISIL A1+ (corresponds to *very strong degree of safety regarding timely payment of financial obligations*).

- **Income tax**

  The Central Board of Direct Taxes has approved ARAI for exemption purposes under Sec. 35(1)(ii) of the Income Tax Act, 1961 vide Notification No. 9/2007 (F.NO. 203/18/2005-ITA-II) dated 28-3-2007 effective 1-4-2004.

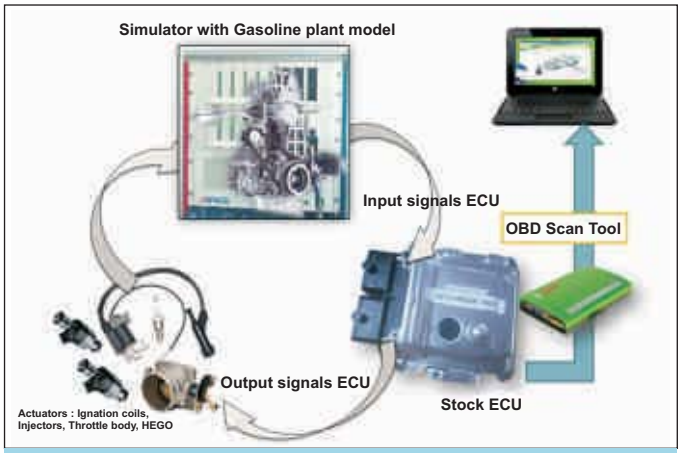
Establishment of Inspection & Certification (I&C) Centres

Under an initiative of Ministry of Road Transport & Highways (MoRTH), ARAI has been identified as main facilitator for establishment of six model Inspection & Certification (I&C) Centres, one each in Maharashtra, Rajasthan, Gujarat, Karnataka, Telangana and Odisha. Nasik Centre in Maharashtra will be the first to be operational shortly, with installation & commissioning activities being completed.

R&D Projects

R&D projects at ARAI are primarily internally funded or DHI supported. The details on the various projects (both completed and ongoing) are mentioned in the subsequent chapters.

This year, three internally funded projects were completed. A 3D road profile database of Indian roads has been generated in one of these projects. The other two projects have resulted in upgrading the technical know-how and technologies in the area of electronics and engines.



Control Strategies for GDI ECU Application

Control Strategies for Adaptive Front Lighting

The ongoing research projects are primarily for competency building in light weighting, electric vehicles technology, alternate powertrains and safety & ride comfort. These include three projects supported by DHI and ten projects funded internally by ARAI.

Business Development

- During the year, various new services / software / databases have been developed. Some of these are electric / hybrid vehicles & e-rickshaw certification; electric vehicle prototype development; CAE based certification for bus rollover simulation, CAE simulation of SUPD & RUPD; engine design software; design & development of crash bollard; digitized 3D road profile data (ARAI-MARG); vehicle data analysis software; evaluation of CEVs, ambulances & school buses etc.

- Showcasing and demonstrating of ARAI's facilities and capabilities in design, development, testing and certification of automobiles & automotive components at thirteen domestic and four international exhibitions / seminars

- MoU signed with Tennessee Technology University, USA for B. Tech. / M. Tech. and Student / Faculty exchange programs

Quality Management

- Successful completion of 2nd Surveillance Audit of ISO 9001, ISO 14001 and OHSAS 18001 of ARAI, Pune and ARAI-FID, Chakan

- Successful completion of NABL Re-assessment of four testing and four calibration fields. It included addition of NVH tests in mechanical testing scope and blow by meter calibration under new fluid flow calibration

- During the year, two ARAI personnel were certified as qualified Lead Auditor and one personnel was certified as Auditor. With these additions ARAI has four Lead Auditors and Four Auditors for conducting CoP verification audit on behalf of RDW, Netherlands

- Business Performance Management Software for monitoring and analysis of business data is operational

Corporate Social Responsibility (CSR)

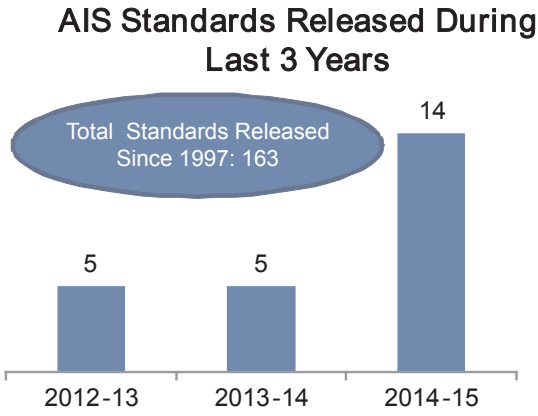
ARAI had taken up Corporate Social Responsibility (CSR) initiative voluntarily in 2008, earmarking 0.5% of previous year's surplus as financial support for CSR activities. From 2013-14, this allocation has been enhanced to 1%. This year, six projects were supported under this initiative.

Homologation & Regulation

FORMULATION OF SAFETY STANDARDS

ARAI provides secretariat services to Automotive Industry Standards Committee (AISC) since its inception in 1997 and contributes towards formulation of safety standards.

A total of 163 AIS standards have been published as of Financial Year 2014-15 covering wide range of subjects for different categories of motor vehicles.



- **New Automotive Industry Standards Released**

  This year 14 standards and 19 amendments to AIS were released on following subjects.

  - New Standards
    - Type Approval procedure for Electric and Hybrid Electric Vehicles introduced in market for pilot / demonstration projects intended for Government Scheme
    - End - of Life Vehicles
    - Location, identification and operation of controls, tell tales and indicators for 2-wheeled vehicles
    - Constructional and functional requirements of road ambulances
    - Medical equipment for road ambulances
    - Type Approval procedure and certification of motor caravans for compliance to CMVR
  - Revised Standards
    - Technical specifications to be submitted by vehicle manufacturer
    - Spray suppression system for 4-wheelers
    - Electric Powertrain Vehicles:
      - Construction and functional safety requirements
      - Measurement of electrical energy consumption
      - Method of measuring the range
      - Measurement of net power and maximum 30 minute power
    - Performance of lighting and light-signalling devices for Agricultural Tractors
    - External projections – Performance requirements for M1 category vehicles
  - Amendments to AIS Published
    - Wind screen wiping system for other than M1 category vehicles
    - Front fog lamps for 4-wheelers
    - Speed limiting devices
    - CNG and LPG fuelled vehicle
    - Survival space for occupants of vehicle
    - Automotive lamps
    - Tyre selection for 2, 3 and 4-wheeled vehicles
    - Bus Body Code
    - Requirements of school bus
    - Requirements of temporary cabin for drive-away-chassis configuration / vehicles
    - Vehicle alarm system
    - Rear marking plates
    - Fuel tank for 4-wheeled vehicles
- **Standards Finalized**
  - Light Emitting Diode (LED) light sources for use in approved lamp units on power driven vehicles and their trailers
  - Revision of Truck Body Code
  - Standards under Finalization

Standards on following subjects are nearing finalization and are expected to be completed during 2015-16.

- o Adaptive Front Lighting System (AFS)
- o Procedure for approval of vehicles produced or imported in small series, single vehicles and vehicles produced or imported under pilot / demonstration projects

- **Standards under Revision**
  - CMVR Type Approval for Battery Operated Vehicles
  - Procedure for Type Approval and Certification of Vehicles for Compliance to CMVR
- **Amendments to existing Standards**

  Amendments to several AIS are under consideration in the Technical Panels under AISC and are expected to be finalized in 2015-16.
  - Requirements for protection of occupants in the event of an offset frontal collision
  - Pedestrian safety
  - Light-signalling devices for L category
  - TA and CoP for safety critical components
  - Installation requirements of lighting and light-signalling devices for 4-wheeled vehicles
  - Automotive Vehicle – Types – Terminology
  - Battery Operated Vehicles – Safety requirements of traction batteries

COOPERATION WITH BUREAU OF INDIAN STANDARDS (BIS)

Indian Standards on automotive safety components and systems are formulated in various TED (Transport Engineering Department) Sectional Committees of BIS. Transformation / adaptation of AIS into IS, is one of the major activity in TED. ARAI provides technical guidance / expertise to BIS and also, has the responsibility of Chairmanship of following TED Sectional Committees.

- TED 2: Automotive Prime Movers, Transmission Systems and Internal Combustion Engines
- TED 6: Automotive Body Chassis Accessories and Garage Equipment
- TED 22:Transport Tractors, Trailers and Industrial Trucks
- TED 26: Automotive Vehicles Running on Non-Conventional Energy Sources.
- TED 29: Passive Safety Crash Protection Systems

- **CMVR and its implementation**
  - CMVR Technical Standing Committee

    ARAI provides technical secretariat services to CMVR Technical Standing Committee. During the year, committee approved several AIS Standards and their future implementation schedule. CMVR-TSC has identified following subjects of national importance for formulation of policy / norms / standards and their implementation.
  - Type Approval Procedure for Electric and Hybrid Electric Vehicles introduced in market for Pilot / Demonstration Projects intended for Government Scheme

    Department of Heavy Industry (DHI) has introduced National Electric Mobility Mission Plan – 2020 to promote Electric and Hybrid Electric technology in the country. AIS-131 on the approval procedure of above vehicles to facilitate this scheme has been formulated.
  - Vehicle Recall Policy

    Many countries in the world have established mandatory or voluntary vehicle recall system for safe transport. A need was felt for a mandatory & Government administered vehicle recall policy and evolving of suitable guidelines in the interest of consumer and road safety. Implementation of recommendations of the committee is under discussion.
  - Following New Technology Subjects are under discussion
    - o Norms for dual fuel (Diesel-CNG) vehicles: Safety standards formulated and implementation of the same is under discussion.
    - o Approval procedure for vehicles running on Ethanol: Notification for implementation of norms for vehicles running on Ethanol is in process.

- Approval for Bio-CNG vehicles for pilot studies: Notification for implementation of vehicles running on Bio-CNG for pilot studies is in process.

INTERNATIONAL COOPERATION AND HARMONIZATION OF NATIONAL STANDARDS

- **National Committee on WP.29**

  ARAI provides Technical Secretariat services for National Committee on WP.29 matters and Core Group on WP.29 related activities. India became signatory to 1998 Agreement under UN ECE as part of our commitment to harmonization of automotive regulations. Under this agreement Global Technical Regulations (GTRs) are being formulated. This year, India has voted in favour of following UN GTRs and amendments to existing GTRs.

  - Amendment 2 to GTR 3 on motorcycle brake system
  - Amendment 3 to GTR 4 on Worldwide Heavy Duty Certification Procedure (WHDC)
  - GTR 16 on tyres for vehicles in categories 1 (M) and 2 (N), all with a gross vehicle mass of 4,536 kg or less
  - Amendment 1 – Addendum 2 to Mutual Resolution NO. 1 (M.R.1) of the 1958 & 1998 Agreement

    Further, as a second step, action has been initiated in Automotive Industry Standards Committee (AISC) to transpose GTRs into our national standards.

- **Participation in Technical Sessions of WP.29**

  This year, India participated in several technical sessions of WP.29, its subsidiary working parties and Informal Group meetings. Total fifteen delegations were sent on different occasions under ARAI's leadership and with active participation from the industry. Secretariat at ARAI provided technical and other support to these national delegations for attending sessions at United Nations, Geneva, Switzerland.

  Highlights of India's views presented on proposal for Revision 3 of 1958 Agreement, (which is under discussion in WP.29 sessions) are given below.

  - Revision of 1958 Agreement is aimed at to provide a basis for facilitating accession of emerging economies to the Agreement and to extend Mutual Recognition of Approval (MRA) through establishing IWVTA (UN R 0).
  - India had informed during the 164th session of WP.29 held in November 2014 that it is already a Contracting Party to 1998 Agreement. Further, it was informed that some of its suggestions were under consideration with respect to the 1958 Agreement and ideally, India would prefer a consensus vote. Also, some suggestions such as proxy voting, choice for accepting or not accepting higher version of UN Regulation, mechanism of validation of test agencies, dispute resolution mechanism, flexibility to apply a UN Regulation to a sub-set of vehicle categories, Contracting Party's right to declare which versions it would accept, etc. were yet to reach a consensus.
  - India appreciated that several countries had shown interest in developing the Indian market. This had improved the indigenous manufacturing industry in India. However, India is carefully analyzing the advantages that the 1958 Agreement would bring.
  - It was informed that apart from being a large consumer market, India is also a significant producer of automobiles. India had established testing facilities and is planning advanced testing centres in near future. India also aspired to participate in other markets in future.
  - India would like to actively participate in all WP.29 sessions and remains committed to better safety, emission and energy solutions, thus accepting regulations which are relevant for the country.

- **Election of Vice-Chairman for GRPE (Working Party on Pollution and Energy)**

  Mrs. Rashmi Urdhwareshe, Director – ARAI was unanimously elected as Vice-Chairperson of GRPE under UNECE for the year 2015 sessions.

- **Worldwide Harmonized Light Vehicles Test Procedure (WLTP)**

  India is actively involved in WLTP Project since its inception, by way of necessary data collection and raising India specific issues / concerns relating to wide range of India vehicle spectrum (including low powered vehicles in both M1 and N1 categories).This

participation has helped in incorporation of major changes in the global test cycle and procedures.

ARAI hosted the 9th session of Informal Working Group on WLTP for light vehicles on behalf of India during 17-20 November, 2014 at ARAI. More than 45 participants from different countries representing various organizations, test agencies and ministries, viz. MLIT, NTSEL, JARI, JASIC, German Federal Ministry, Italy, France, Sweden, Netherland, JRC, European Commission, SIAM and ARAI participated in this meeting. This meeting was very successful in its deliberations and concluded on various open issues related to WLTP.

As per road map, GTR No. 15 was adopted by GRPE and was further endorsed by WP.29 in its March 2014 session. GTR 15 is planned to undergo assessment through round robin test program at regional and global level. ARAI has planned and coordinated a national level round robin test program to asses GTR 15 and testing work is expected to be completed by May 2015.

India is also participating in Asia round robin, wherein vehicles will be tested at ARAI, Korea, China and Japan. Asia round robin will be completed by January, 2016. Further, there will be exchange of one vehicle between Europe round and Asia round to complete the global round robin. A joint meeting of golden engineers from Japan and Europe will be held during this exchange program at ARAI, India.

WLTP Phase-2 is to start very soon after finalization of new working items by 11th session in June, 2015 and endorsed by GRPE. India will continue with its active participation in future.

- **Environmental and Propulsion Performance Requirements (EPPR) for L – category vehicles**

The activities under Environmental and Propulsion Performance Requirements (EPPR) are very important to India considering the large production of 2 and 3 wheelers. The EPPR Informal Group directly works under WP.29 / GRPE to revise type approval procedures for L-category vehicles such as powered cycles, mopeds, motorcycles, tricycles and quadricycles. EPPR has decided the priority to work upon L3 and L1 categories. Currently, formulation of 2 new GTR's on evaporative emissions, crankcase emissions and OBD for these category vehicles are under progress.

India is actively participating in the group by providing various proposals during meetings held at Geneva, China and Brussels. India provided proposals on open issues like Non-metallic fuel tank with metallic cap to define non-exposed fuel tank. India's proposal based on the data was accepted in last session.

TYPE APPROVAL CERTIFICATION

- **Implementation of New Safety Standards**

During the year Type Approval and Certification for several safety components and emission norms were implemented for different categories of vehicles. ARAI has carried out testing and approval for safety norms implemented during this year and initiated work for the same for safety norms to be implemented in 2015-16. Some of the highlights are:

- New standard on approval of in-use vehicles retrofitted with Hybrid Electric System, w.e.f. 28th May, 2014
- Bus Body Code w.e.f. 1st October, 2014 for new models and w.e.f. 1st April, 2015 for existing models
- IS on Windscreen Wiping System for four wheelers w.e.f. 1st October, 2014
- IS on Horn Installation requirements for all motor vehicles, w.e.f. 1st October, 2014
- Revised IS on Rear Under-run Protective Devices, w.e.f. 1st October 2014
- Revised IS on Lateral Protection (Side Guard), w.e.f. 1st October 2014
- New category of vehicle – Quadricycle: Emission and Safety norms, w.e.f. 1st October, 2014
- E-Rickshaw and E-cart: Definition and safety norms, w.e.f. 8th October, 2014
- Vahan Data Portal:
  - o Vehicle manufacturers to upload data of vehicle details from 1st January 2015
  - o ARAI has approved above data for 2500 number of vehicle models and its variants
- New standard on Rear Marking Plates applicable to vehicle categories: N2>7.5 T, N3, T1, T2 and T3 > 8m, T4, Articulated busses w.e.f. 1st April 2015

- Revised IS on calibration of speedometer for new models of 2, 3 and 4 wheeled vehicles, Agricultural Tractors and Construction Equipment Vehicles (CEVs) w.e.f. 1st April 2015
- New standard on Child Restraint System for non-transport M1 category of vehicles, w.e.f. 1st April 2015
- Provisions for requirement of Automatic Wear Adjustments for braking systems extended to all 4 wheeled vehicles w.e.f. 1st April 2015
- New provisions for requirement of Anti-Lock Braking Systems for new models of M3 and N3 category vehicles, w.e.f. 1st April 2015
- Agricultural Tractors:
  - Revised norms for: Control, Tell Tales, w.e.f. 1st April 2014, Driver Perceived Noise and Pass by Noise levels, Filament Lamps, Brake Hose w.e.f. 1st April 2015
  - New norms for: Driver's Field of Vision w.e.f. 1st April 2014, Windscreen Wiping System, Tractor Identification Number (TIN), Fuel Tanks, Maximum Design Speed w.e.f. 1st April 2015

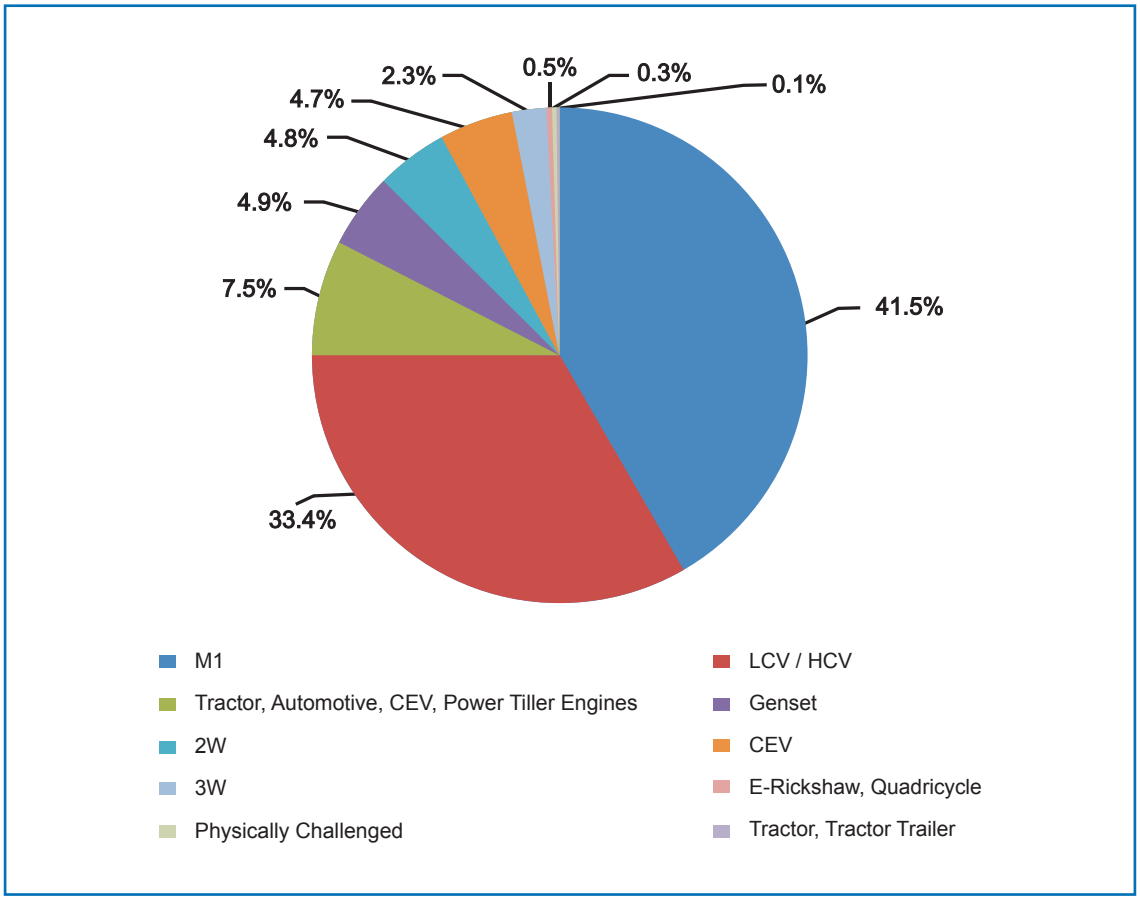
- **Implementation of Emission Norms**
  - Revised emission norms for gensets up to 19 kW run on petrol and kerosene w.e.f. 1st August 2014
  - Revised emission norms for diesel engines having power above 19 kW and up to 800 kW for Genset applications w.e.f. 1st July 2014
  - Bharat Stage III (BS III) norms for Industrial Power Sweeper and Gasoline Agricultural Tractor w.e.f. 1st October 2014
  - Mass Emission Standards Bharat Stage IV (BS IV) for 4 wheelers for 20 more cities w.e.f. 1st October 2014

    Revised norms for Pollution Under Control Certification (PUC) for Petrol, CNG & LPG vehicles w.e.f. 1st October 2014
- **Notifications for implementation of Safety Standards in future**
  - Notifications have been issued for implementation of following safety standards during 2015-2016:
    - New provisions for approval of Modular Hydraulic Trailers, w.e.f. 1st April, 2015
    - New provisions for approval of Combined Harvesters, w.e.f. 1st April, 2015
    - Indian Standards on safety components for vehicles running on CNG w.e.f. 24th July 2015
    - Requirements of Anti-Lock Braking Systems (ABS) for existing models of M3 and N3 category vehicles w.e.f. 1st October 2015
    - New norms of Electromagnetic Compatibility (EMC) for L category (existing models) and BS IV compliant M and N category vehicles w.e.f. 1st October 2015
    - Driver of M1 category of non-transport vehicle to ensure that a child up to age of twelve years carried in the vehicle is seated in an appropriate child restraint system conforming to AIS-072 w.e.f. 1st April 2016
    - Revised IS on calibration of speedometer for existing models of 2, 3 and 4 wheeled vehicles w.e.f. 1st April 2016
    - Automotive Trailer Code as per AIS-113 w.e.f. 1st April 2016
    - Requirements of Mechanical Coupling Components of combinations of vehicles as per AIS-091 (Part 1) w.e.f. 1st April 2016
    - Approval of Close-Coupling Device (CCD) and vehicles of N2, N3, T3 and T4, if fitted with such devices w.e.f. 1st April 2016
    - Requirements of wheel rims fitted on trailers and semi-trailers w.e.f. 1st April 2016
  - Draft notifications published in 2014-15 on following subjects for future implementation of the safety standards:
    - Braking system for combination of agricultural tractor and trailers
    - Fitment of Rear Underrun Protective Devices (RUPD) and Lateral Protection (Side Guard) for in-use vehicles
    - Fitment of speed limitation devices on transport vehicles

- **Notifications for implementation of Emission Norms in future:**
  - Mass emission norms Bharat Stage IV (BS IV) for new models of two wheelers w.e.f. 1st April 2016 and for existing models w.e.f. 1st April 2017
  - The Average Fuel Consumption Standard for motor vehicles of petrol or diesel or LPG or CNG, used for carriage of passengers and their luggage and comprising not more than nine seats including driver's seat and GVW not exceeding 3500 kg. w.e.f. 1st April 2016
  - Draft rules for mass emission standards Bharat Stage IV (BS IV) for 3 wheelers
  - Draft rules for revised test procedure for free acceleration smoke measurement for diesel vehicles
  - Draft rules for permitting Bio-CNG for motor vehicles as an alternate composition of the CNG and emission norms
  - Draft rules for mass emission standards for flex-fuel ethanol (E85) and ethanol (ED 95) vehicles

TYPE APPROVAL CASES DURING THIS YEAR

This year ARAI crossed the mark of 2158 cases relating to CMVR Type Approval. Each case being unique in nature, all certification departments handled this work very efficiently. Customers have expressed full satisfaction on the aspects of timely completion, technical accuracy and administrative ease of our operations. Wide range of the work completed is evident from the chart below:



Corporate Social Responsibility (CSR)

ARAI had taken up Corporate Social Responsibility (CSR) initiative voluntarily in 2008. Since then, ARAI has contributed over Rs.79 Lakh for projects undertaken by organizations engaged in empowerment of underprivileged and specifically in the areas of environment, education and health. ARAI had been earmarking 0.5% of its previous financial year's surplus for CSR activities, which was subsequently enhanced to 1% in Financial Year 2013-14.

This year, following six projects were supported under CSR initiative.

- Twenty bunk beds provided to an orphanage school, Naisargik Shikshan Santha, Malavali, Dist. Pune. This orphanage provides shelter, education and vocational training for destitute and neglected street children.
- Lockers for storage of clothes and belongings given to 'Swadhar', a NGO based in Pune. This NGO works in the area of maternal and child health, education, empowerment, vocational training and livelihood of children from red light area of Pune.
- Assistance for procurement of Bone Densitometry equipment extended to Indian Red Cross Society, a non-profit organization which works for poor patients.
- Financial assistance for procurement of Water Purifier provided to 'Anath Balakashram' an NGO based near Trimbakeshwar in Nasik District, Maharashtra. This NGO works for maternal & child health, education, empowerment and livelihood of children from rural & tribal area.
- Financial assistance for procurement of 'A-Scan Machine' provided to Maharashtra Education Society's Parshuram Hospital & Research Centre at Lote Parshuram, Dist. Ratnagiri, Maharashtra. This hospital caters to poor patients and students from rural area.
- Support provided to Lui Braille Aandh-Apang Kalyan Sanstha for procurement of vehicle for carrying their orchestra instruments and for other institutional work. This organization works for poor blind boys and girls in Pune.

Financial assistance for Lockers to 'Swadhar'

Support to Parshuram Hospital & Research Centre for procurement of 'A-Scan Machine'

Papers Presented / Published

- 'Light-weight Materials and their Automotive Applications' by Sujeet Kumar Sah & M. A. Bawase in April 2014 at International Conference on Automotive Materials & Manufacturing (AMM-2014), Chakan, Pune

- 'Influence of Rake Angle and Cutting Speed on Residual Stresses Developed in the Cutting Tool during Orthogonal Cutting' by Santosh P. Rahane & Prof. V. D. Wakchuare of Amrutvahini College of Engineering and S. M. Mulla of ARAI in April 2014 at International Conference on Automotive Materials & Manufacturing (AMM-2014), Chakan, Pune

- 'Optimizing the Strength and Ductility of Al-6061 Alloy by various Post – Rolling ageing treatments' by Sumeet Mishra & Dr. K. N. Kulkarni of IIT Kanpur and S. M. Mulla & P. S. Phale of ARAI in April 2014 at International Conference on Automotive Materials & Manufacturing (AMM-2014), Chakan, Pune

- 'Utilization of Knowledge Based Techniques for Streamlining the Characterization Procedure of Acoustic Material Properties' by Y. S. Thipse in April 2014 at International Conference on Automotive Materials & Manufacturing (AMM-2014), Chakan, Pune

- 'Derivation of non-linear stiffness characteristics for lumped uniaxial springs from Hyperelastic material constitutive models' by Y. S. Thipse in April 2014 at International Conference on Automotive Materials & Manufacturing 2014, Chakan, Pune

- 'Impact of Digital Information Services on LIS Education: A Case Study of ARAI Knowledge Centre' by Dr. A Madhava Rao & Dr. K.C. Vora in May 2014 at National Seminar on LIS Education in India with special reference to ODL: Prospect & Retrospect, organized by Department of Library & Information Science in collaboration with the University Library, Dr. B. R. Ambedkar Open University, Hyderabad

- 'Library Stock Verification using RFID Technology Tools' by Dr. A. Madhava Rao, Mrs. S. M. Potdar, Mrs. S. S. Joshi, Mrs. S. S. Das & Dr. K. C. Vora in May 2014 at State Level Seminar on Library Stock Verification organized by MAEER's MIT School of Management, Pune.

- 'Road Surface Friction Coefficient (Mue) Determination for Traction Control System' by Mrs. U. S. Karle, S. R. Ghugal, Anand Subramaniam & A. B. Komawar in June 2014 at FISITA 2014, Netherlands

- 'Methodology Development for Transfer Path Analysis (TPA) on Washing Machine' by A. S. Luktuke, R. Ramkumar, E. Ramachandran, A. B. Shewale & N. V. Karanth in June 2014 at Siemens PLM Connection India 2014

- 'Necessity to mandate Automatic Headlamp Leveling' by M. Siva, Ms. V. S. Bhagat, B. V. Shamsundara & A. V. Mannikar in June 2014 at 'International Forum of Automotive Lighting (IFAL)', Shanghai, China

- 'Noise Source Identification of Household Washing Machine using Transfer Path Analysis' by A. B. Shewale, R. Ramkumar, A. S. Luktuke, E. Ramachandran & N. V. Karanth in July 2014 at The 21st International Conference on Sound and Vibration, Beijing, China

- 'Proficiencies in Creating an Institutional Repository (IR) in Automotive Research Association of India (ARAI) using D Space: A Case Study' by Dr. A. Madhava Rao & Dr. K. C. Vora in September 2014 at International Conference on Sustainability of Digital Libraries organized by Jawaharlal Nehru Technological University, Hyderabad

- 'Innovation, the Jugaad Way' by Dr. K C Vora in October 2014 at Annual Technical Paper Meet 2014, Pune

- 'Role of ARAI Knowledge Centre in providing Qualitative Information Services – A case study' by Mrs. S. S. Joshi, Mrs. S. M. Potdar, Mrs. S. S. Das & Dr. K. C. Vora in November 2014 at National Seminar on

Qualitative Information Services in Academic Library organized at Rajarshi Shahu College, Kolhapur

- 'Study of various parameters affecting the acoustical performance of Firewall using experimental techniques' by S. K. Jain, Manasi Joshi & N.V. Karanth in November 2014 at ANV Conference, Chennai
- 'Implementation of karakuri kaizen in material handling unit' by Dhiyaneswar R. & Ashok B. of VIT University, Vellore; Saravanan A. K. of TAFE; and Mohd. Rafiq B Agrewale of ARAI in January 2015 at SIAT 2015 Conference, Pune
- 'Virtual Development of System Architecture for Hybrid Electric Fuel Cell Light Commercial Vehicle Application' by Siddharth Das of VIT Vellore; and S. S. Ramdasi, R. V. Mulik & N. V. Marathe of ARAI in January 2015 at SIAT 2015 Conference, Pune
- 'Challenges Faced for Parameterization & Validation of a Small Gasoline Engine Plant Model for Application of EMS Development' by R. G. Shah, S. R. Ghugal, Mrs. U. S. Karle & A. A. Deshpande in January 2015 at SIAT 2015 Conference, Pune
- 'Development of Electric Power Assisted Steering (EPAS) considering Safety & Reliability aspects as per ISO:26262' by M. L. Karle, Prakhar Srivastava, Mrs. U. S. Karle & A. A. Deshpande in January 2015 at SIAT 2015 Conference, Pune
- 'Application of Scanning Electron Microscopy for Used Oil Analysis' by A. A. Manwatkar, P. S. Phale, M. A. Bawase & M. R. Saraf in January 2015 at SIAT 2015 Conference, Pune
- 'Contribution of Organic and Elemental Carbon Fractions in Indian in-used Vehicle Exhaust Particulate Matter' by M. A. Bawase, Mrs. A. A. Baikerikar & M. R. Saraf in January 2015 at SIAT2015 Conference, Pune
- 'Parametric Optimization of Bio-Diesel Production from Jatropha Curcus' by Darshan Jain, Saravanan Kumarasamy & Dr. K. C. Vora in January 2015 at SIAT 2015 Conference, Pune
- 'Design & Development of a Hybrid Electric Two-Wheeler' by N. S. Gopi Krishnan & K. P. Wani in January 2015 at SIAT 2015 Conference, Pune
- 'Design and Analysis of Semi-active Suspension System using Skyhook, Groundhook and Hybrid Control Models for a Four Wheeler' by Ishwar Patil and K. P. Wani in January 2015 at SIAT 2015 Conference, Pune
- 'Use of combined CAE and Experimental Testing Approach for Engine Noise Reduction' by Y. V. Surkutwar, M. A. Patwardhan, N. V. Karanth & A. A. Gaikwad in January 2015 at SIAT 2015 Conference, Pune
- 'Productivity improvement in Forging Process by using Computer Simulation' by S. A. Kulkarni, A. R. Kumbhar, J. M. Paranjpe & N. V. Karanth in January 2015 at SIAT 2015 Conference, Pune
- 'Use of Non Linear Analysis in Powertrain Design for Prediction of Cylinder Bore Distortion, Design Changes for Reduction along with Experimental Validation' by M. A. Patwardhan, J. M. Paranjpe, S. S. Ramdasi, N. V. Karanth, N. V. Marathe & P. S. Bhat in January 2015 at SIAT 2015 Conference, Pune
- 'Prediction of thermal comfort inside a Midibus Passenger Cabin using CFD and its Experimental Validation' by N. V. Daithankar, K. D. Udawant & N. V. Karanth in January 2015 at SIAT 2015 Conference, Pune
- 'A Study to address the Failure Mechanism of the Conventional 3-Point Restraint in Protecting the Far Side Occupant in a Rollover Accident' by Chandrashekhar Thorbole of Thorbole Simulation Technologies LLC and S. R. Deshpande of ARAI in January 2015 at SIAT 2015 Conference, Pune
- 'Use of Combined CAE and Experimental Testing Approach for Engine Noise reduction' by Yogesh Surkutwar, M. A. Patwardhan, N. V. Karanth, & A. A. Gaikwad in January 2015 at SIAT 2015 Conference, Pune

- 'Injection Strategies, Experiments and Simulation Analysis on DI CNG Technology' by Dr. S. S. Thipse, S. B Sonawane, Ashwin F D' Souza, S. D. Rairikar, K. P. Kavathekar & N. V Marathe in January 2015 at SIAT 2015 Conference, Pune

- 'Development of Dual Fuel (Diesel-CNG) Engine for SUV application in India' by Dr. S. S. Thipse, S. D. Rairikar, S. B. Sonawane, V. S. Sagare, Subhanker Dev, K. P. Kavathekar, P. G. Mengaji, Mrs. U. S. Karle, N. V. Marathe & Kausik Sinha from ARAI and A. V. Kulkarni & S. J. Vispute from Vanaz Engineers Ltd. in January 2015 at SIAT 2015 Conference, Pune

- 'Design and Development of Variable Valve Actuation (VVA) Mechanism Concept for Multi-Cylinder Engine' by Ashish Jain, S. S. Tikar, S. S. Ramdasi, Dr. S. S. Thipse, N. V. Marathe & Porpatham Ekambaram in January 2015 at SIAT 2015 Conference, Pune

- 'A Knowledge Based Algorithm to Streamline Estimation of Engine Performance Parameters from Combustion Pressure, Crank Signal - Time History Test Data' by Ashwin Subramanian K., Y. S. Thipse, V. S. Sagare & N. V. Marathe at SIAT 2015 Conference, Pune

- 'Up-gradation of Two Cylinder NA Diesel Genset Engine into TCIC Configuration for Achieving Stricter Emission Norms for 19 kW to 75 kW Power Categories' by P. G. Bhat, Dr. S. S. Thipse, N. V. Marathe, Narendra Pawar, Hirak Jyoti Gayen, D. B. Narwade, Bhaskar Melage & S. V. A. Achari in January 2015 at SIAT 2015 Conference, Pune

- 'Strategies to Meet Revised Stage-II Emission Norms for TCIC Diesel Genset Engine above 75 kW' by P. G. Bhat, N. V. Marathe, Bhaskar Melage, Hirak Gayen, D. B. Narwade, Narendra Pawar, Dharmdev Vyas, Samadhan Awate & Abhishek Meshram in January 2015 at SIAT 2015 Conference, Pune

- 'Development of Indigenous Methodology for Design and Dynamic Analysis of Engine Valve train System with Timing Chain Drive for High Speed Applications' by R. V. Mulik, S. S. Ramdasi & N. V. Marathe in January 2015 at SIAT 2015 Conference, Pune

- 'Use of Software/Hardware in Loop technique for development of semi-active suspension' by Mrs. M. S. Jambhale, Mrs. J. G. Kale & M. R. Saraf of ARAI and Arunrajkumar Govindhasamy & Karl-Eric-Kostlin of TESIS International Gmbh in January 2015 at SIAT 2015 Conference, Pune

- 'Estimation of tire friction potential characteristics by slip, based on road test using WFT' by P. R. Pawar & M. R. Saraf of ARAI and P. Sankarganesh of Apollo tyres Ltd. in January 2015 at SIAT 2015 Conference, Pune

- 'Emergency Intimation Service – Post crash safety' by M. Siva, Ms. V. S. Bhagat, B. V. Shamsundara & A.V. Mannikar in January 2015 at SIAT 2015 Conference, Pune

- 'Innovation in Human Resource Development (HRD) for Automotive Industry through Collaborative Approach' by Dr. A. Madhava Rao, Dr. K. C. Vora, Dr. S. A. Patil & R. M. Patil, published in Technical Reference Bulletin of SIAT 2015 Conference, Pune

- 'The loosening of bolt using strain gauging technique' by N. P. Mehendale, S. R. Munot & V. V. Shinde, published in Technical Reference Bulletin of SIAT 2015 Conference, Pune

- 'An innovative automatic tool for managing the correlation of several FE result values with corresponding test data' by Y. S. Thipse in February 2015 at NAFEMS India Regional Conference 2015, Chennai

- 'E-Collection and its access at ARAI Knowledge Centre' by Mrs. S. S. Das & Dr. K. C. Vora in March 2015 at National Level Seminar on Impact of E-Publications on Higher Education and Librarianship organized at Modern College, Pune

Events

SIAT 2015

Fourteenth edition of 'Symposium on International Automotive Technology', (SIAT 2015), was organized by ARAI in association with SAEINDIA, NATRiP and SAE International (USA) at ARAI, Pune during 21st to 24th January 2015. The Chief Guest for the inaugural function of this biennial event was Mr. Anant Geete, Hon'ble Union Minister for Heavy Industries and Public Enterprises, Government of India. The other dignitaries present on this occasion included Mr. Ambuj Sharma, Additional Secretary, Department of Heavy Industry, Ministry of Heavy Industries & Public Enterprises, Govt. of India, Mr. Vinod Dasari, President, ARAI & Managing Director, Ashok Leyland Ltd.; Mr. Rajan Wadhera, Vice President, ARAI, President and Chief Executive, Truck & Powertrain Division, Head – Mahindra Research Valley, Member of the Group Executive Board, Mahindra & Mahindra Ltd.; Dr. David Schutt, COO, SAE International, USA; Dr. Aravind Bharadwaj, President, SAEINDIA & Sr. Vice President Mahindra & Mahindra Ltd.; Mrs. Rashmi Urdhwareshe, Director – ARAI & Chairperson SIAT 2015 Advisory Committee; and Dr. K. C. Vora, Sr. Deputy Director, ARAI & Convener, SIAT 2015.

SIAT 2015 was successful with participation of over 1500 delegates from all over the world. During this symposium 44 keynote papers were presented and 213 technical papers were published by experts from India and abroad. These papers focused on innovative approaches to reach the goals of environmentally sustainable, comfortable and affordable mobility and were in-line with the theme of the event - “Towards Safer, Cleaner & Quieter World”. Symposium proceedings were published on DVD along with Technical Reference Bulletin, which contained 36 articles on different topics and case studies written by experts.

The symposium was complemented with SIAT EXPO 2015, which was organized concurrently with it. The exposition had 205 stalls showcasing latest technology solutions, products and services. Technology Theatres, organized during SIAT 2015, presented a platform for the participating companies to promote their products and services to a large number of prospective clients. A special panel discussion on 'Industry Academia Enclave on Automotive Engineering' was conducted wherein, Industry, Academia, ASDC / NSDC and Media had participated. Student Poster Presentation Competition provided an opportunity to the students to showcase their abilities to industry professionals.

A panel discussion on 'International Mobility Beyond Boundaries' was organized on 23rd January 2015, which had distinguished speakers from top six vehicle manufacturing countries – China, USA, Japan, Germany, South Korea and India. Mr. Sanjay Bandopadhyaya, Joint Secretary, MoRTH, Government of India was the Chairman and Moderator for this discussion and Mrs. Rashmi Urdhwareshe, Director – ARAI hosted this discussion. The distinguished speakers for this panel discussion included Dr. Zhu Yi, Senior Engineer & Executive Secretary of Chinese WP29 Working Committee, China Automotive Technology and Research Center; Mr. Takao Onoda, Director, International Affairs Office, Engineering Planning Division, Road Transport

Bureau, Ministry of Land, Infrastructure, Transport and Tourism (MLIT), Japan; Dr. Joseph Kanianthra, Former Associate Administrator for Research, NHTSA, U.S. Dept. of Transportation, USA; Mr. Christoph Albus, Head of Division, Road Vehicle Engg-Environment, Federal Ministry of Transport, Building and Urban Development, Germany; Mr. Kyong Chan Min, Researcher, Korea Automobile Testing & Research Institute (KATRI); and Mr. A.S. Puri, Senior Advisor (Govt. Affairs & Collaboration), Tata Motors Ltd., India.

The Chief Guest for the valedictory function was Mr. Nitin Gadkari, Hon'ble Union Minister for Road Transport & Highways and Shipping, Government of India. The other distinguished guests present on this occasion included Guest of Honour Mr. M. C. Dathan, Director, Vikram Sarabhai Space Centre (VSSC), Thiruvananthapuram; Mr. Sanjay Bandopadhyaya, Joint Secretary, MoRTH, Govt. of India, Mr. Nitin Gokarn, CEO & Project Director, NATRiP, Mrs. Rashmi Urdhwareshe, Director – ARAI & Chairperson SIAT 2015 Advisory Committee; and Dr. K. C. Vora, Sr. Deputy Director – ARAI & Convener, SIAT 2015. During this function, various awards were distributed at the hands of the Chief Guest.

- **Other Highlights of SIAT 2015 :**
  - Biggest SIAT Expo with 205 stalls
  - Special theme pavilion with 3D Technology display
  - SIAT website upgraded to facilitate registration and payment
  - Online abstract/paper submission/review through SAE portal MyTechZone
  - Digital signage system at conference halls and other locations
  - LED video wall for theme film & keynote presentations and e-backdrop
  - Mobile Apps for conference & expo
  - Sponsor advertisements through LCD displays, running film and Technical Reference Bulletin
  - Indian scientist gallery, interactive car bed, cultural programs, laser show, etc.

SIAT 2015 AWARDS

The event recognized best paper with following awards in various categories during the valedictory function. Also, three awards were given for the best stalls at SIAT Expo 2015.

- Best Technical Paper (3 awards)
- Best International Paper
- Best Indian Paper on Environment & Pollution
- Best Paper on Safety
- Best Paper on Simulation & Modelling
- Best Oral Presentation
- Best Student Poster Presentation (in Automotive Emission, Automotive NVH, and Automotive Safety areas)
- Mahesh Modi Environmental Excellence Awards
- SIAT EXPO 2015 Stall Awards

ARAI bagged three prestigious awards during this event. These included First Place in best Technical Paper category, Best Paper on Simulation & Modelling category and Second Place in EXPO Stall category.

Next Edition of Symposium on International Automotive Technology 2017 is scheduled to be held during 18th to 21st January 2017.

AM&M 2014

International Conference on Automotive Materials and Manufacturing (AM&M 2014) was organized by ARAI in association with IIT-Kanpur; Vellore Institute of Technology, Vellore; VEL TECH Dr. RR & Dr. SR Technical University, Chennai; ASM-Pune Chapter; and Association of Indian Forging Industry (AIFI) during 28th to 30th April, 2014 at ARAI – FID, Chakan, Pune. The theme of this conference was 'Light Weighting through innovative materials, processes and design'. This conference was inaugurated by Hon'ble Padma Vibhushan Dr. Anil Kakodkar, Chairman – TIFAC, DAE Homi Bhabha Chair Professor, BARC. The other dignitaries on this occasion were Prof. Indranil Manna, Director-IIT Kanpur; Dr. David L Schutt, Chief Executive Officer, SAE International; Mr. Shrikant R. Marathe, Director, ARAI and Mr. M. R. Saraf, Deputy Director - ARAI. During the inauguration, proceedings of the conference were released, which contained 64 high quality research papers and abstracts.

During this conference, which was attended by 275 delegates, 62 papers were presented, including 18 keynote papers, covering 9 different topics in Materials Engineering and Manufacturing Technologies. An exposition held concurrently with this conference, had a participation of 26 companies showcasing their latest technologies and products. A key highlight of this exposition was 'Materials Theme Pavilion', organized by IIT Kanpur, DSM Engineering Plastics and ARAI. This pavilion highlighted the current research being conducted in various automotive technologies ranging from engines to future lightweight, high-strength and high impact-resistance materials.

The conference concluded with organizing of a panel discussion and valedictory function. The topic for panel discussion was 'Lightweight Material Challenges and Reality' and participants included Prof. R. K. Ray, R&D Division-Tata Steel Ltd.; Dr. Amol Gokhale, Director – Defence Metallurgical Research Laboratory; Mr. Hemant Nerurkar, Ex-MD Tata Steel and Chairman-Board of Governors XLRI Jamshedpur; Mr. Shrikant R. Marathe, Director–ARAI; and Dr. Anil Sahasrabudhe, Director – College of Engineering Pune (moderator of the discussion). The Chief Guest for the valedictory function was Hon'ble Padma Vibhushan Dr. Kantilal H. Sancheti. During the valedictory function, awards viz. best technical papers (1st and 2nd), best entry in poster presentation and best entry in artistic micrography (given in memory of Late Dheeraj R. Suryawanshi who had worked with ARAI) were given at the hands of the Chief Guest.

SUPPORTING SAEINDIA ACTIVITIES

ARAI supports SAEINDIA's wide spectrum of activities carried out for the benefit of practicing engineers, engineering students and school children. SAEINDIA Western Section in association with ARAI organizes training and educational programmes, workshops and knowledge dissemination for enhancing human resource skills to meet the growing industry requirements.

- **Workshops / Seminars / Lectures**
  - Tech Talk Series Lecture by Mr. Tushar Kanikadale on 'Design For Six Sigma'
  - Workshop on 'CAE for Powertrain Application'
  - Workshop on 'Multi Axis Testing – Improving Durability of Automotive Components' (jointly conducted by ARAI, MOOG & SAEINDIA Western Section)
  - Workshop on 'Advanced Driver Assistance & Active Safety' (jointly conducted by ARAI & SAEINDIA Western Section)
  - Workshop on 'Material Testing using a Digital Image Correlation' (jointly conducted by ARAI & SAEINDIA Western Section)
  - Workshop on 'Emission & Our Environment' (jointly conducted by ARAI & SAEINDIA Western Section)
  - Workshop on 'Stringent Noise Emission Regulations: Solutions from Pass by Noise Testing to Pass by Noise Engineering' (jointly conducted by ARAI, LMS – A Siemens Company & SAEINDIA Western Section)

- During the year, ARAI sponsored SAEINDIA's activities like AWIM (A World in Motion), BAJA, SUPRA, SAEINDIA Off-highway programs. ARAI also provided support in the form of volunteers, technical reporters and judges for BAJA and AWIM activities. The volunteers had the responsibility of initial inspection as technical inspectors of BAJA All Terrain Vehicle. In case of AWIM, the volunteers played the role of mentors and trained the school children.

BAJA SAEINDIA 2015 was held from 19th to 24th February 2015 at NATRAX facility of NATRiP in Pithampur, Indore. BAJA SAEINDIA comprises of virtual BAJA, technical scrutiny, student workshops, faculty workshop, design / cost report submission etc. The HR meet, which followed this event, was a perfect platform for participating companies to recruit the best of talent from the pool of BAJA participants.

AWIM Pune Olympics 2014 – A World **I**n **M**otion (AWIM) competition for School Children of 5th & 6th Standard was held on 22nd November, 2014 at The Orchid School, Pune. The event was a grand success with participation of more than 224 students from 17 different schools, demonstrating their knowledge and skills. More than 150 volunteers from ARAI, John Deere, Eaton and Cummins joined hands to train school students for over a period of three months. The winner of AWIM Pune Olympics 2014 participated in AWIM National Olympics held on 11th January 2015 held at Mahindra & Mahindra's Plant at Chakan.

BAJA 2015 held at Pithampur Indore

AWIM Pune Olympics 2014

Knowledge Centre

Knowledge Centre is a skill development initiative of ARAI. It undertakes training, educational programs and knowledge dissemination activities for Human Resource Development to meet the growing needs of the automotive industry & academia. These activities are carried out through Learning Centre, Training Centre & Library.

LEARNING CENTRE

Learning Centre conducts undergraduate, postgraduate and doctorate programs, with specialization in Automotive Engineering through collaboration with various universities. It has tie-ups with VIT University (Vellore), VEL TECH University (Chennai), College of Engineering (Pune), University of Alabama (USA), Tennessee Tech University (USA), Loughborough University (UK) and Technical University of Braunschweig (Germany). Brief summary of the joint programmes conducted is given below.

VIT University, Vellore	• Ph.D. in Automotive Engineering for Industry Professionals • M. Tech. in Engine Technology for Industry Professionals • M. Tech. in Powertrain Electronics for Industry Professionals • M. Tech. in Automotive Engineering • B. Tech. in Mechanical Engineering with specialization in Automotive Engineering
VELTECH University, Chennai	• M. Tech. in IC Engines • M. Tech. in Automotive Electronics & Embedded Systems
College of Engineering, Pune	• M. Tech. in Automotive Technology
University of Alabama, Birmingham, USA	• M. S. in Mechanical Engineering with Automotive Engineering emphasis
Tennessee Tech University, USA	• Dual Degree Programme for M. Tech. / M. S. • Student & Faculty Exchange Program
Braunschweig University, Germany	• Students & Faculty Exchange Program

Prominent highlights of the year:

- MoU signed with Tennessee Technology University, USA for B. Tech. / M. Tech. and Student / Faculty Exchange programs
- MoU signed with Cummins India, Ashok Leyland, Eaton Technologies, Magna Steyr, Mahindra & Mahindra, Tata Motors (ET & PTE), and Tata Autocomp Hendrickson Suspensions for deputing their engineers for M. Tech. in Engine Technology and Powertrain Electronics (conducted jointly by ARAI with VIT University)
- First batch of 19 Industry Professionals from Eaton, Tata Motors and Cummins joined the M. Tech. Program in Powertrain Electronics being jointly conducted by VIT University and ARAI.
- Enrolment of three engineers from various industries for joint Ph.D. programme in June 2014, taking the total to 12 students
- Competitions in Chess, Carom, Table Tennis, Football, Volleyball and Cricket conducted for academy students

MoU with Eaton Technologies, Tata Motors, Tata Hendrickson

MoU with Tennessee Technological University, USA

LIBRARY

ARAI's Knowledge Centre is equipped with a vast collection of books and standards in automotive and related subjects for the benefit of employees, SAE members and academy students. It also serves industry professionals and other students through its membership options. During the year, it added 155 books & 77 standards and subscribed to 40 journals & 25 e-books from Elsevier and Woodhead publisher. Also, in addition to regular subscription of SAE digital library and specific sections of BIS Standards, selected SANS Standards from South African Bureau of Standards have been subscribed this year.

TRAINING CENTRE

This year, Training Centre organized 34 Proficiency Improvement Programs (PIPs) & 2 Domain Training Programs (DTPs) at ARAI, Pune, and 6 PIPs at ARAI – FID, Chakan. These lectures were given by ARAI officials, academicians and eminent industry experts, including speakers from abroad. These PIPs & DTPs had a participation of 1990 delegates and were conducted in the following areas of automotive engineering.

- Vehicle Dynamics & Hardware-in-Loop
- Engine Design & Development
- Automotive NVH
- Automotive Lighting
- Understanding and Applying Automotive Functional Safety as per ISO 26262
- Powertrain Engineering
- CAE for Powertrain Application
- Automotive Engineering
- Multi Axis Testing : Improving Durability of Automotive Components
- Advanced Heat Transfer
- Automotive Sensors & Actuators
- Advanced Driver Assistance & Active Safety
- Material Testing using Digital Image Correlation
- Engine Testing & Certification
- Power Train Tribology
- Emissions & our Environment
- Automotive Fuels & Energy
- Research Methodology
- Systems Engineering
- Applied Engineering Mathematics Thermodynamic Analysis of I.C Engines
- Embedded System Design
- Powertrain NVH
- Embedded System Development for Automotive Application
- Stringent Noise Emission Regulations: Solutions from Pass by Noise Testing to Pass by Noise Engineering
- Engine Emission & Control
- Engine Combustion
- Advanced Automotive Engineering
- Advanced Fluid Mechanics

- Software Development Life Management
- Engine Control Systems
- Automotive Electronics & Embedded System
- Material Failure Mode Analysis
- Metallurgy for Non Metallurgist
- Industrial Automation
- Advances in Forging Technology
- Design of Experiments
- DTP on Automotive Engineering
- DTP on Automotive Electrical & Electronic Systems with emphasis on 2/3 Wheelers

PIP on 'Automotive NVH'

PIP on 'Powertrain Engineering'

Dr. K. C. Vora, Sr. Deputy Director and Head – ARAI Academy received the prestigious GURU AWARD from Mr. Vikram Kirloskar, President of SIAM & Vice Chairman of Toyota Kirloskar Motor Private Limited in presence Mr. Daniel Hancock, President SAE International USA during SAEINDIA Foundation Annual Award Function on 30th July 2014 at New Delhi.

Mr. Mohammad Rafiq B. Agrewale of ARAI Academy received DRONACHARYA AWARD as a Best Faculty Advisor from Dr. S. Thirumalini, Convenor – SUPRA SAEINDIA and Member & Chair, Engineering Education Board of SAEINDIA in presence of Dr. Murali Kadiramangalam, Director-Academic Program, ANSYS INDIA Ltd. during SUPRA SAEINDIA EVENT 2014 on 20th July 2014 at Madras Motor Race Track, Chennai.

GURU AWARD to Dr. K C Vora

DRONACHARYA AWARD to Mr. Mohammad Rafiq B. Agrewale

Establishment of Test Facilities Under NATRiP at Chakan

ARAI's facilities are undergoing comprehensive upgradation under NATRiP to match with the global peers. These facilities are being developed as Centres of Excellence in Powertrain; and Fatigue & Materials; in addition to Homologation facilities for Passive Safety, including full vehicle crash systems. They are being established on an industrial plot measuring 5.5 Ha. area in Phase III MIDC, Chakan, which has an advantage of proximity to the end-users, i.e., automotive and auto component industry. The details on laboratories being established and progress of work is given below.

PASSIVE SAFETY LABORATORY – HOMOLOGATION

Passive Safety Laboratory is for evaluation of vehicular safety performance under impact conditions. The core facilities for crash test have already been installed at this laboratory. Some of the major services this laboratory will cater to are given below.

- Crash tests like full frontal, offset frontal, side impact, rear impact, airbag ECU calibration and component evaluation of frontal structure
- Seat testing as per IS 15546 / AIS 023 / ECE R17 / ECE R80
- Luggage retention test as per IS 15546 / ECE R17
- Tests for door locks and door retention components as per GTR 1 / ECE R11
- Child restraint system dynamic test as per AIS 072 / ECE R44
- Safety belt testing as per IS 15140 / ECE R16
- Determination of dynamically determined head impact zone as per IS 15223:2014 / ECE R21
- Child seat installation and GSR 291(E) certification

Crash Test Facility

Advanced Programmable Deceleration Sled

Moving Barriers / Deformable Barriers

Pole Side Impact

Static Rollover Facility

POWERTRAIN LABORATORY – CENTRE OF EXCELLENCE :

This laboratory will be for testing of vehicles; engines & powertrains; and other accessories; for their performance with respect to power, efficiency, exhaust emissions etc. It consists of different types of engine / chassis dynamometers; controlling & measuring equipment; and instrumentation. The laboratory and test cells will be climatically controlled and fitted with advanced systems for fire protections, telecommunications and data transfer for ensuring confidentially. The laboratory shall be treated acoustically for control of noise pollution. The major facilities in this laboratory include:

- Vehicle Test Cell to test vehicles up to Light Commercial Vehicle (LCV) category using 4 x 4 Chassis Dynamometer for performance and emission tests, up to Euro-V certification
- Climatic Soak Room (-30° C to 50° C)
- Vehicle Test Cell to test vehicles up to Light Commercial Vehicle (LCV) category using 4 x 4 Chassis Dynamometer with controlled climate at temperature of 25° C ± 3° C associated with humidity control for emission tests up to Euro-V certification
- Soak Room for above test cell with temperature of 25° C ± 3° C
- Mileage accumulation test cell with 4 x 4 Chassis Dynamometer for endurance testing
- Test Cell for Transmission / Gear box performance testing
- Variable Volume / Variable Temperature (VV / VT), Sealed Housing for Evaporative Determination (SHED) Area

FATIGUE TESTING LABORATORY – CENTRE OF EXCELLENCE :

This laboratory shall be for prediction of structural failures & evaluation of vehicular structural components; systems & sub systems; and chassis / full vehicle subjected to real life dynamic loading conditions. It includes seismic foundations, super strong floor areas to sustain reaction loads of very high magnitude and high-pressure high-volume centralized hydraulic power system with its distribution through underground piping network. Salient features of this laboratory are:

- Climatic MAST facility for components
- Climatic 4 Poster for LCV
- X Poster
- Universal Test Benches with maximum capacity of 500 kN

- HPS of 2600 LPM (expandable to 4000 LPM), 210 bar with piping network
- Electro-dynamic Shaker with climatic chamber
- Instrumentation and vehicle preparation area

The above laboratories are supported with Power Station, Transformer Yard, Captive Genset of 4000 kVA, Panel Rooms, Underground Water Storage Tank, Fuel Stations, Underground Fuel Storage Tanks, Client Workshops, General Storage and Maintenance Workshop.

Progress of Work :

The civil construction is almost complete with over 95% activity being completed. Also, almost all utility contracts for electrical systems, fuel distribution, LAN, voice & data, security system, HVAC systems etc. have been awarded further to techno-commercial evaluation of bids received through open tendering system and about 80% of utility works have been completed. Contracts worth of Rs. 119 crore have been awarded and remaining utility contracts worth Rs. 9.15 crore are under finalization. Installation & commissioning activity of Passive Safety Laboratory has been completed and the necessary approval for building occupancy and operation of facilities is expected by November / December 2015. In case of Fatigue & Powertrain Laboratories, installation work is expected to be completed by December 2015.

Powertrain Laboratory

Fatigue Laboratory

ARAI

Progress through Research

AUDITORS' REPORT & ANNUAL STATEMENT OF ACCOUNTS

- Auditors' Report
- Annual Statement of Accounts

THE AUTOMOTIVE RESEARCH ASSOCIATION OF INDIA

Auditors' Report

To

The Members
The Automotive Research Association of India

1. We have audited the accompanying financial statements of The Automotive Research Association of India ("the Association"), which comprise the Balance Sheet as at March 31, 2015, and the Income and Expenditure Account for the year then ended, and a summary of significant accounting policies and other explanatory information.

2. **Management's Responsibility for the Financial Statements**

   The Association's Management is responsible for the preparation of these financial statements that give a true and fair view of the financial position, financial performance of the Association in accordance with the Accounting Standards. This responsibility includes the design, implementation and maintenance of internal control relevant to the preparation and presentation of the financial statements that give a true and fair view and are free from material misstatement, whether due to fraud or error.

3. **Auditor's Responsibility**

   3.1 Our responsibility is to express an opinion on these financial statements based on our audit. We conducted our audit in accordance with the Standards on Auditing issued by the Institute of Chartered Accountants of India. Those Standards require that we comply with ethical requirements and plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

   3.2 An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditor's judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the Association's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances but not for the purpose of expressing an opinion on the effectiveness of the Association's internal control. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of the accounting estimates made by management, as well as evaluating the overall presentation of the financial statements.

   3.3 We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

4. **Opinion**

   In our opinion and to the best of our information and according to the explanations given to us, the financial statements give a true and fair view in conformity with the accounting principles generally accepted in India:

   (a) in the case of the Balance Sheet, of the State of affairs of the Association as at March 31, 2015; and;

   (b) in the case of the Statement of Income and Expenditure Account, of Surplus for the year ended on that date.

For A. R. Sulakhe & Comp.
Chartered Accountants
Firm Registration No.110540W

J V Dhongde
Partner
Membership No. 37290

Place : Pune

Dated August 1, 2015

THE AUTOMOTIVE RESEARCH ASSOCIATION OF INDIA

Balance Sheet as on 31st March 2015

(Rs. in Lakhs)

PARTICULARS	SCHEDULE NO		AS ON 31/03/2015		AS ON 31/03/2014
SOURCES OF FUNDS					
1. GENERAL & OTHER FUNDS					
A) GENERAL FUND	1	51315.45		42588.82	
B) R & D RESERVE FUND	2	21646.96		20122.65	
C) REPLACEMENT OF EQUIPMENT/MACHINERY FUND	3	9433.63	82396.04	8785.62	71497.09
2. PROJECT FUNDS (NET)	4		586.33		1412.89
3. CURRENT LIABILITIES AND PROVISIONS	5		6532.66		6390.70
TOTAL			**89515.03**		**79300.68**
APPLICATION OF FUNDS :					
1. FIXED ASSETS	6		44291.95		27925.04
2. CURRENT ASSETS, DEPOSITS AND ADVANCES					
A) INVENTORIES	7(A)	43.12		33.66	
B) SUNDRY DEBTORS	7(B)	3897.21		3003.47	
C) DEPOSITS, CASH & BANK BALANCES	7(C)	39832.33		46450.06	
D) ADVANCES	7(D)	1195.42		1800.23	
E) SUNDRY DEPOSITS	7(E)	255.00	45223.08	88.22	51375.64
TOTAL			**89515.03**		**79300.68**
NOTES TO THE ACCOUNTS	13				

Mrs. Rashmi Urdhwareshe
Director

Rajan Wadhera
Vice President

Vinod Dasari
President

As Per Separate
Report of Even Date
For A. R. Sulakhe & Comp.
Chartered Accountants
F. R. No. 110540 W

J. V. Dhongde
Partner
Membership No. 37290

THE AUTOMOTIVE RESEARCH ASSOCIATION OF INDIA

Income and Expenditure Account for the year ended 31st March 2015

(Rs. in Lakhs)

PARTICULARS	SCHEDULE NO		YEAR ENDED 31/03/2015		YEAR ENDED 31/03/2014
INCOME					
SPONSORED PROJECTS, TESTING, LEARNING & TRAINING CENTRE	8		18730.68		17128.74
ANNUAL MEMBERSHIP SUBSCRIPTION	-		408.97		415.18
SIAT 2015 / AMM 2014 INCOME	-		702.56		0.00
FUNDS TRANSFERRED FROM R&D RESERVE FUND	-		80.51		34.48
INTEREST	9		3719.14		3946.53
OTHER INCOME	10		132.80		297.82
TOTAL			**23774.66**		**21822.75**
EXPENDITURE					
SPONSORED PROJECTS, TESTING, LEARNING & TRAINING CENTRE EXPENSES	-		2060.06		2144.67
ARAI R&D PROJECTS	-		80.51		34.48
SALARIES & OTHER ALLOWANCES	11		7985.65		7176.31
EMPLOYEE RELATED EXPENSES	-		260.29		192.09
OPERATION & ESTABLISHMENT EXPENSES	12		2384.94		2068.35
DEPRECIATION	-	2852.98		2359.44	
(LESS: DEPRECIATION ON GOVT. FUNDED ASSETS) (Ref. : Note No 1 (3) (a) of Schedule No. 13)		1326.72	1526.26	1186.50	1172.94
SIAT 2015 / AMM 2014 EXPENSES	-		449.42		5.05
EXCESS OF INCOME OVER EXPENDITURE			**9027.53**		**9028.86**

THE AUTOMOTIVE RESEARCH ASSOCIATION OF INDIA

Income and Expenditure Account for the year ended 31st March 2015

(Rs. in Lakhs)

PARTICULARS	SCHEDULE NO		YEAR ENDED 31/03/2015		YEAR ENDED 31/03/2014
APPROPRIATION					
A) INTEREST ON EARMARKED FUNDS TRANSFERRED TO RESPECTIVE FUNDS					
- R&D RESERVE FUND		1604.82		1909.44	
- REPLACEMENT OF EQUIPMENT/ MACHINERY FUND		648.01	2252.83	864.47	2773.91
B) SURPLUS (DEFICIT) OF SIAT 2015 / AMM 2014 TRANSFERRED TO GENERAL FUND			253.14		-5.05
C) EXCESS OF INCOME OVER EXPENDITURE (NET)			6521.56		6260.00
TOTAL			**23774.66**		**21822.75**
NOTES TO THE ACCOUNTS	13				

Mrs. Rashmi Urdhwareshe
Director

Rajan Wadhera
Vice President

Vinod Dasari
President

As Per Separate
Report of Even Date
For A. R. Sulakhe & Comp.
Chartered Accountants
F. R. No. 110540 W

J. V. Dhongde
Partner
Membership No. 37290

THE AUTOMOTIVE RESEARCH ASSOCIATION OF INDIA

Statement Showing Receipts & Payments on Cess Projects for the year 2014-2015

APPENDIX - I

(Rs. in Lakhs)

Sr No	NAME OF THE PROJECT	PROJECT COST	RECEIPTS			PAYMENTS			*REFUNDED TO THE GOVT	AMOUNT BORNE BY ARAI		NET FUNDS AVAILABLE (6-9-10+11+12)
			UPTO 2013-14	2014-15	TOTAL (4+5)	UPTO 2013-14	2014-15	TOTAL (7+8)		UPTO 2013-14	2014-15	
1	2	3	4	5	6	7	8	9	10	11	11	13
1	Study & Development of vehicle suspension for Indian Road Conditions for better ride compforts & less fatigue to Driver Using Hardware in Loop Simulation Technology	800.00	400.00	0.00	400.00	764.18	0.00	764.18	21.48	385.66	0.00	0.00
2	Generate Data Bank on Chemical, Mechanical, Physical & Dynamic properties of Automotive grade High Strength steels (HSS) & Aluminium Alloys	500.00	250.00	0.00	250.00	458.29	0.00	458.29	18.93	227.22	0.00	0.00
3	Development of Accelerated Test Programme for life prediction of auto electric components	185.00	92.50	0.00	92.50	118.18	0.00	118.18	33.32	59.00	0.00	0.00
4	Measurement of Wheel Forces of 4-Wheel Automotive Vehicles and Study of Their Co-relation with Customer Usage Pattern	700.00	350.00	0.00	350.00	695.68	0.00	695.68	0.00	345.68	0.00	0.00
5	Study of Vehicles System Duty Cycle / Operation Pattern Under Indian Road Conditions	650.00	325.00	0.00	325.00	618.37	11.03	629.40	8.18	301.55	11.03	0.00
6	Design Analysis of Lightweight aluminium intensive city transit bus for maximum light weighting for Indian Conditions	484.00	200.00	284.00	484.00	166.83	229.60	396.43	0.00	0.00	0.00	87.57
7	Offline and Real time simulator for Electric Vehicle/Electric Vehicle Systems	1155.83	100.00	503.00	603.00	187.86	439.19	627.05	0.00	87.86	(87.86)	-24.05
8	Materiial Compability & Emmision Performance with Ethanol Blended Gasoline (E20)	331.00	0.00	50.00	50.00	0.00	100.90	100.90	0.00	0.00	0.00	-50.90
9	Effect of Deformation Temperature on Hot Forging Material	400.00	400.00	0.00	400.00	360.11	39.98	400.09	0.00	0.00	0.09	0.00
10	Study & Development of Lightweight Forging Process for Automotive Components	380.00	0.00	100.00	100.00	0.00	26.75	26.75	0.00	0.00	0.00	73.25
	TOTAL	**5585.83**	**2117.50**	**937.00**	**3054.50**	**3369.49**	**847.45**	**4216.94**	**81.91**	**1406.97**	**(76.74)**	**85.87**
	PREVIOUS YEAR	**4874.83**	**2117.5**	**-**	**2117.5**	**3369.55**	**-**	**3369.55**	**81.93**		**-**	**73.06**

* Includes refunded to Government during previous years

Statement Showing the Receipts and Payments on Projects Funded By NATRiP for the year 2014-2015

APPENDIX - II

(Rs. in Lakhs)

SR NO	NAME OF THE PROJECT	PROJECT COST	RECEIPTS			PAYMENTS			EXPENSES BORNE by ARAI	NET FUND AVAILABLE AS ON 31.03.2015
			UPTO 2013-2014	2014-2015	TOTAL	UPTO 2013-2014	2014-2015	TOTAL		
1	EXPANSION OF EXISTING FACILITIES AT SDL	200.00	200.00	0.00	200.00	198.25	0.00	198.25	0.00	1.75
2	PROCUREMENT OF ENGINE TEST EQUIPMENTS / INSTRUMENTS FOR CELL C2 OF NEW EDL	59.38	59.38	0.00	59.38	52.73	0.00	52.73	0.00	6.65
3	DEVELOPMENT OF CIVIL INFRASTRUCTURE UNDER NATRiP PROJECT	5509.00	5141.51	367.49	5509.00	5014.88	3236.00	8250.88	2741.88	0.00
4	DEPOSITORY WORK FOR PWT 4-HVAC ARAI A/C.	965.00	965.00	0.00	965.00	595.63	179.03	774.66	0.00	190.34
	TOTAL	**6733.38**	**6365.89**	**367.49**	**6733.38**	**5861.49**	**3415.03**	**9276.52**	**2741.88**	**198.72**
	PREVIOUS YEAR	6733.38	6365.89	-	6365.89	5861.49	-	5861.49	-	504.39

APPENDIX - III

Statement showing Receipts And Payments for Inspection Maintenance Project Cell (IMPC) for the year 2014-2015

(Rs. in Lakhs)

SR NO	NAME OF THE PROJECT	PROJECT COST	RECEIPTS					PAYMENTS					NET FUND AVAILABLE
			2011-2012	2012-2013	2013-2014	2014-2015	TOTAL	2011-2012	2012-2013	2013-2014	2014-2015	TOTAL	
1	SETTING UP OF A MODEL INSPECTION & CERTIFICATION CENTRE AT NASIK IN MAHARASHTRA	1440.00	140.00	385.00	-	200.17	725.17	0.63	110.65	184.23	327.93	623.44	101.73
2	SETTING UP OF A MODEL INSPECTION & CERTIFICATION CENTRE AT RAILMAGARA IN RAJASTHAN	1440.00	0.00	240.00	295.00	194.91	729.91	0.50	61.61	211.08	317.49	590.68	139.23
3	SETTING UP OF A MODEL INSPECTION & CERTIFICATION CENTRE AT NELAMANGALA, BANGALORE DISTRICT IN KARNATAKA	1440.00	140.00	0.00	385.00	0.00	525.00	0.66	62.28	168.71	260.89	492.54	32.46
4	SETTING UP OF A MODEL INSPECTION & CERTIFICATION CENTRE AT MALKAPUR IN HYDERABAD DISTRICT IN ANDHRA PRADESH	1440.00	0.00	0.00	40.00	0.00	40.00	0.00	0.56	11.24	11.24	23.04	16.96
5	SETTING UP OF A MODEL INSPECTION & CERTIFICATION CENTRE AT OLPADA IN SURAT DISTRICT IN GUJARAT	1440.00	0.00	0.00	40.00	0.00	40.00	0.00	0.56	16.85	11.24	28.65	11.35
	TOTAL	**7200.00**	**280.00**	**625.00**	**760.00**	**395.08**	**2060.08**	**1.79**	**235.66**	**592.11**	**928.79**	**1758.35**	**301.74**
	PREVIOUS YEAR	7200.00	280.00	625.00	760.00	-	1665.00	1.79	*235.66	592.12	-	829.56	835.44

* Net of previous year adjustments

APPENDIX - V

FIXED ASSETS SCHEDULE - 2014-2015

(Rs. in Lakhs)

		GROSS BLOCK				DEPRECIATION				NET BLOCK	
	Particulars	As on 31/03/2014	Additions during the year	Deductions during the year	As on 31/03/2015	As on 31/03/2014	Deductions during the year	Provided during the year	Total upto 31/3/2015	As on 31/03/2015	As on 31/03/2014
I.	Land	2,345.75	-	-	2,345.75	-	-	-	-	2,345.75	2,345.75
II.	Building & Roads Etc.	5,580.31	179.01	-	5,759.32	1,393.76	-	298.63	1,692.39	4,066.93	4,186.57
III.	Plant & Machinery	23,990.42	4,637.72	76.64	28,551.50	10,927.72	63.82	1,755.42	12,619.32	15,932.18	13,062.70
IV.	UNDP Equipment Recd. in Kind	343.44	-	34.93	308.51	308.28	32.19	3.26	279.35	29.16	35.16
V.	Furniture & Fixtures	504.06	17.24	0.40	520.90	259.58	0.27	67.73	327.04	193.86	244.48
VI.	Office Equipments	267.21	7.56	0.16	274.61	153.61	0.12	54.60	208.09	66.51	113.60
VII.	Computer & Peripherals	1,112.73	163.21	10.18	1,265.76	967.33	9.83	175.67	1,133.17	132.60	145.40
VIII.	Vehicles	423.74	150.44	92.47	481.71	258.04	68.34	120.93	310.63	171.07	165.70
IX.	Air-conditioners	468.34	7.85	-	476.20	317.16	-	41.18	358.34	117.86	151.18
X.	Intangible Assets										
	A) Computer Software	1,317.46	275.39	0.10	1,592.75	848.28	0.10	335.58	1,183.76	408.99	469.18
	B) Patent	-	-	-	-	-	-	-		-	-
	Total	**36,353.47**	**5,438.42**	**214.88**	**41,577.01**	**15,433.76**	**174.67**	**2,853.00**	**18,112.08**	**23,464.96**	**20,919.70**
	Capital Work In Progress					-	-	-	-	20,826.99	7,005.34
	GRAND TOTAL	**36,353.47**	**19,279.90**	**235.91**	**62,404.00**	**15,433.76**	**174.67**	**2,853.00**	**18,112.10**	**44,291.95**	**27,925.04**
	Previous year Gross Total	32,528.73	3,987.30	162.57	36,353.46	13,200.34	126.04	2,359.46	15,433.76	27,925.04	23,110.22

THE AUTOMOTIVE RESEARCH ASSOCIATION OF INDIA

FIXED ASSETS SCHEDULE - 2014-2015
(Assets Procured out of Government Funds)

(Rs. in Lakhs)

	Particulars	GROSS BLOCK				DEPRECIATION				NET BLOCK	
		As on 31/03/2014	Additions during the year	Deductions during the year	As on 31/03/2015	As on 31/03/2014	Deductions during the year	Provided during the year	Total upto 31/3/2015	As on 31/03/2015	As on 31/03/2014
I.	Land	20.92	-	-	20.92	-	-	-	-	20.92	20.92
II.	Building & Roads Etc.	3,636.23	34.11	-	3,670.34	1,079.99	-	244.34	1,324.33	2,346.00	2,556.23
III.	Plant & Machinery	15,159.52	2,667.35	76.15	17,750.72	8,136.70	63.46	938.77	9,012.00	8,738.72	7,023.64
IV.	UNDP Equipment Recd. in Kind	343.44	-	34.93	308.51	308.28	32.19	26.25	302.34	6.17	35.16
V.	Furniture & Fixtures	124.04	-	-	124.04	68.78	-	19.09	87.87	36.18	55.26
VI.	Office Equipments	21.29	-	-	21.29	12.31	-	4.05	16.36	4.93	8.98
VII.	Computer & Peripherals	343.78	-	0.61	343.17	329.20	0.61	10.54	339.14	4.04	14.58
VIII.	Vehicles	46.74	-	-	46.74	36.31	-	4.11	40.41	6.33	10.43
IX.	Air-conditioners	308.86	-	-	308.87	222.05	-	22.48	244.52	64.34	86.82
X.	Intangible Assets										
	A) Computer Software	453.57	-	0.10	453.47	326.80	0.10	57.13	383.83	69.63	126.76
	B) Patent	-	-	-	-	-	-	-	-	-	-
	Total	**20,459.20**	**2,701.46**	**111.78**	**23,048.88**	**10,520.42**	**96.36**	**1,326.76**	**11,750.82**	**11,298.07**	**9,938.78**
	Capital Work In Progress									5,867.54	5,623.76
	GRAND TOTAL	**20,459.20**	**2,701.46**	**111.78**	**23,048.88**	**10,520.42**	**96.36**	**1,326.76**	**11,750.82**	**17,165.61**	**15,562.54**
	Previous year Gross Total	20,189.95	367.54	98.28	20,459.20	9,410.84	76.93	1,186.31	10,520.42	15,562.54	12,456.14

ARAI
Progress through Research

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ARAI

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ARAI Environmental Statement 2014-2015

ARAI has established and implemented ISO14001-2004 i.e.

Environmental Management System, in which environmental legal compliance and continual improvement is successfully demonstrated during surveillance audit conducted by TUV SUD, Certification body, in October 2014.

Legal Compliance

ARAI has applied for renewal of consent to operate to M.P.C.B. However requirements under Section 25 of the Air (Prevention and Control of Pollution) Act, 1981, Section 21 of The Water (Prevention and Control of Pollution) Act, 1974 and Authorization under the Rule 5 of the Hazardous Wastes (Management, Handling & Transboundry Movement) Rules 2008 had been complied.

Measures initiated for environmental protection

- Measures taken to take advantage of natural light and to improve the ventilation in Work shop, the transparent roof sheets and turbo-vents on roof are placed in.
- Water consumption was optimized through leakage prevention, flow control and proper utilization of Sewage treatment plant and Sewage Treatment Plant owing no discharge in public sewage drainage.
- Handed over unused chemicals to educational institute for elimination of safety hazard.
- Phasing out lead acid batteries and replacing it with dry batteries for UPS power supply.
- Green cover is being maintained through regular plantation in & around premises of ARAI.
- Rain Water Harvesting and measures for conservation of water.
- Generation of electricity using solar energy.

ARAI has conducted environmental monitoring of various parameters like:

- DG set stack Monitoring
- Drinking water quality check
- Monitoring sewage water quality and reuse of treated water for irrigation
- Ambient air quality monitoring across ARAI
- Ambient noise level across ARAI

For all the above parameters the results are within the specified limits.

Waste Management

Under waste handling and disposal activities, ARAI has identified various wastages generated by ARAI and eco-friendly disposal of the same is ensured.

- Canteen waste and garden waste are being disposed in compost plant established in house.
- Hazardous wastes like used oil, oil soaked cotton/gloves, empty oil barrels and batteries are being disposed off through parties authorized as recyclers by Government of India/Appropriate Authority.
- Tie up with MPCB authorized hazardous waste disposal agency to dispose the generated hazardous waste of all types on regular basis.
- Environmentally sound management systems are in place to handle hazardous waste, e-waste and plastic waste.
- This Institute has also implemented 5 'S'.

ARAI

Progress through Research

The Automotive Research Association of India

(Affiliated to Ministry of Heavy Industries & Public Enterprises, Govt. of India)

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