

MOBILITY ENGINEERING

ENGLISH QUARTERLY

Vol : 6

Issue : 1

January - March 2019

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PASSENGER
AIR VEHICLE**

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INVENT
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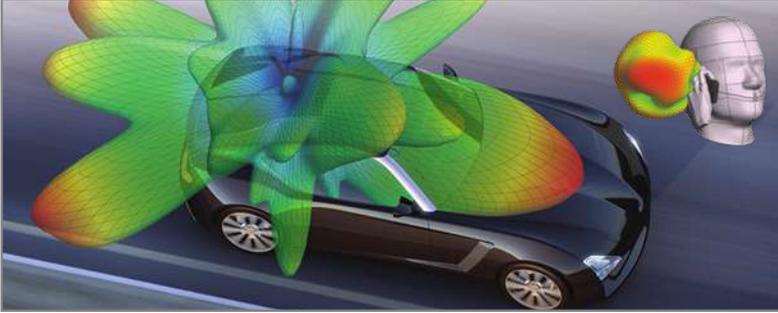


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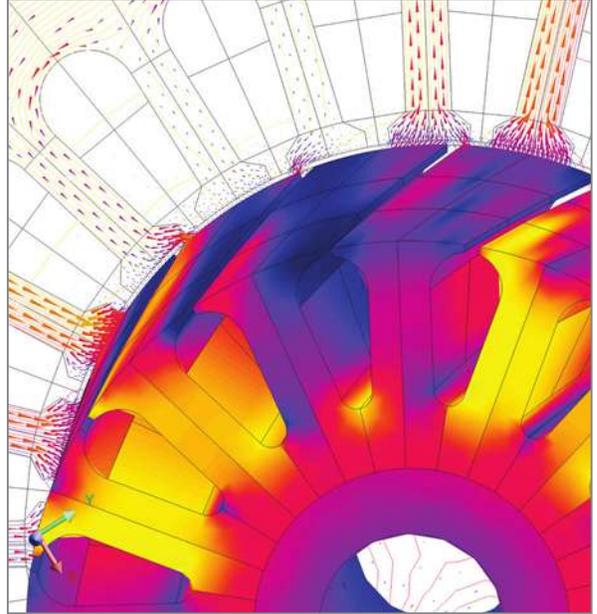
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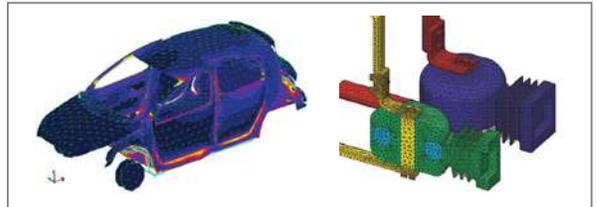
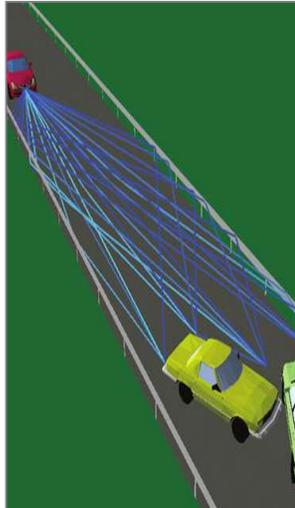
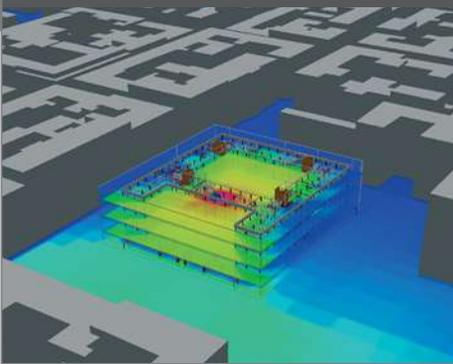
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CONTENTS

Features

36 Harley-Davidson's LiveWire motorcycle

38 HM-T2X01 Cruiser

40 Two-wheeler mobility: The Future is electric

Several niche players in the Indian two-wheeler market are introducing electric bikes and scooters



Cover

Boeing is the world's largest aerospace company and leading manufacturer of commercial jetliners and defense, space and security systems.



CONTENTS

Departments

3 Editorial

4 SAEINDIA News

- 4 EFFICYCLE 2018
- 6 TIFAN 2019
- 8 Student Convention
- 9 AWIM National Olympics
- 11 Aero Design Challenge Workshop
- 13 Aurangabad Division Inauguration

15 SIAT - 2019

A Report of the 16th Edition

20 BAJA - 2019 Indore

A Report of the 12th Edition

49 CES - 2019

Setting the World Abuzz with Innovative Technologies

31 Technology Report

- 31 Reduce Costs and Maximize Efficiency in MD and HD Engines
- 35 Volvo's Electric Buses to serve as Mobile Libraries
- 46 Digitizing the Farming Sector
- 56 Visionaries Invent India's First Flying Bike

23 Technology Update

- 23 Fatigue in Aircraft Structure
- 26 Development and Verification of Air-Conditioning System for Premium Buses
- 48 BOEING Autonomous Passenger Air Vehicle
- 59 Track & Field

63 Interview

Dr. Bala K. Bharadvaj, President, SAEINDIA and Managing Director, Boeing India Engineering & Technology Center



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SAEINDIA

EDITORIAL

Welcome to the latest edition of Mobility Engineering, a complimentary quarterly magazine for SAEINDIA members. Our Members are already gearing up for more PDP programs, Automotive Roundtable, Vehicle Dynamics Workshop in association with NATRAX, 3rd edition of ITEC 2019 (Dec 2019, Bengaluru) and more. Our Magazine features coverage of our biennial mega event SIAT 2019 and the BAJA 2019.

The first two months of 2019 has been a jam-packed period with a whole lot of exciting events under the aegis of SAEINDIA; some of these are written about in the inside pages of Mobility Engineering March 2019 issue, now in your hands. SIAT 2019 held at Pune, BAJA 2019 conducted at Pithampur are featured in the inside pages of this issue of Mobility Engineering March 2019.

Meanwhile, SAEINDIA's Branding & Communication Board has come to full operational power with the appointment of Dr. Arunkumar M. Sampath, Chief Engineer for Electric Vehicles, Mahindra Electric as Chair, for the period 2018 to 2020. He has 23+ years of experience in the gamut of automotive and aerospace/defense fields including NVH, Automotive Electronics, Vehicle Engineering, HEV/EV, Autonomous and Connected Technologies, Project Management and Processes.

He has organized and offered numerous Lectures at prestigious Automotive & Aerospace events in India including CEO Conclave held biannually in NCR, Chennai and Pune, CII events, NASSCOM events, PMI events, Professional Development Programs including "Train the Trainer" program under AICTE, and Annual Conventions in educational institutions including IIT Madras, IIT Jodhpur, Hindustan University, SSN College of Engineering, Rajalakshmi College of Engineering, and Amrita University, to name a few.



DR. ARUNKUMAR M. SAMPATH

Dr. Arunkumar Sampath says:

"The SAEINDIA Mobility Engineering magazine, published quarterly, is a compendium of technical articles relevant to Mobility, conference highlights organized by SAEINDIA in the recent past, and event reports covering professional and academic activities while also being a curtain raiser on upcoming technologies and a forum for suppliers and service providers to advertise their latest developments."

How would it benefit the members of SAEINDIA?

"The objectives of SAEINDIA Mobility Engineering magazine include providing opportunities to practising professionals, faculty members and students to share their knowledge and recent developments as well as for different Sections, Divisions, Boards, and Forums of SAEINDIA to provide reports on the events conducted in their jurisdictions and announcements for upcoming events in addition to acting as an important medium to clear the air on issues relevant to India in general and Mobility in particular," says Dr. Sampath, who is also the SAE International Technical Standards Board Member & Board of Directors Nominee.

I would like you to remember 1-4-5-44 as the magic number for years to come. One SAEINDIA office Four Forums, Five Boards, Four Committees & Four Sections. This is the new operational model for our society.

This issue also focuses on electric two-wheelers – an Indian initiative, an American marquee brand's initial introduction and about a slew of Indian manufacturers who are in the fray. Clearly, electrification of mobility is the future. Read on...

K. Venkataraj
EDITOR



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SAEINDIA

News

EFFICYCLE 2018, 09 - 13 OCTOBER 2018, PHAGWARA



ONE OF THE TEAMS DURING THE EVENT

SAEINDIA Northern Section (SAEINS) successfully conducted the eighth season of Efficycle from 9th to 13th October 2018 at Lovely Professional University (LPU), Phagwara, Punjab. The event was organized in association with Maruti Suzuki (MSIL), International Centre for Automotive Technology (ICAT) and Indian Oil Corporation Limited (IOCL). The event was held under the convenorship of Dr. Reji Mathai, Chief Research Manager, IOCL R&D supported by two Co-Conveners Mr. Deepak Panda of MSIL and Mr. Jitendra Singh Gaur of ICAT.

Teams had designed and fabricated the energy efficient human powered three wheeled electric hybrid vehicle which was driven by two drivers simultaneously using human drive along with electric drive having maximum motor output power of 600W. This year about 73 teams partici-

pated in the main event. The theme for this year was "Dynamic Resilience Season". Teams were guided throughout the season to improve the design parameters & build quality in order to obtain better performance of the vehicle. This year's main focus was to improve the dynamic behaviour of Efficycle vehicles.

Teams had appeared for the technical inspection of their vehicles which includes Safety Check in which technical inspector inspected the vehicle as per the rulebook guidelines, Brake Test to check the brake functioning, Fig of 8 test to check the turning radius of the vehicle and electric inspection to check the output power of the motor. Along with the technical inspection static events like Weight Check, Design Evaluation, Cost Evaluation, Build Quality Evaluation, Innovation round and Marketing Presentation round were started and teams were judged by the experts

SAEINDIA

News

from Automotive industry.

Some teams also presented their ideas on futuristic technologies relevant to Efficycle applications which included use of energy regeneration system, physically disabled friendly features, Collision detection and Speed Control system, usage of composite materials in vehicle frame etc. Teams who cleared their technical inspection were allowed for the dynamics event like Acceleration test in which vehicle has to complete 100m, Gradient simulation test in which vehicle has to run with payload in the vehicle, drive excellence test in which team has to complete 500m track only on electric drive. The teams finishing the individual dynamic event in least time were winners of individual dynamic events.

On the final day the teams who cleared the technical inspection were allowed to participate in 1.5 hours of endurance race on 2 Km track having sharp turns and other diffi-

culties. Endurance was followed by the valedictory ceremony and awards of ₹ 5.60 Lakhs distributed among the winner and runner up of all sub category events like Best Built Up quality, Innovation award, Marketing Presentation award, Design award, Cost award, Light Vehicle award, Drive Excellence award, Gradient Simulation award, Acceleration award, Best Girl participant award, Dronacharya award for faculty, Runner up of endurance run, Winner of endurance run, Overall Second runner up, Overall first runner up and Overall Winner of Efficycle 2018.

This season Overall Winners was Team Green Rangers from Sant longowal Institute of Engineering and Technology, Sangrur, Punjab. First Runner up was Team Effiroaders 6.0 from Chameli Devi Group of Institution, Indore, Madhya Pradesh and Second Runner up of Efficycle 2018 was Team Velociracers from College of Engineering, Pune, Maharashtra.



ONE OF THE TEAMS DURING AWARDS DISTRIBUTION

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News

TIFAN 2019 – QUALIFICATION ROUND, 27 OCTOBER 2018, PUNE



TEAM – TIFAN 2019 QUALIFYING ROUND

SAEINDIA's TIFAN 2019 – Qualification round conducted at MIT, Pune: SAEINDIA Off-Highway Board conducted qualifying round of 2nd edition of its unique competition named TIFAN (Technology Innovation Forum for Agricultural Nurturing) for engineering and agricultural engineering students at “Maharashtra Institute of Technology” (MIT), Pune. The objective of TIFAN competition is to provide a platform for Agricultural product innovation by generating a talent pool for off-highway industry. This competition will also provide the undergraduate students hands-on experience towards Agricultural / off-highway machinery and process. Eventually, such endeavours

will help the society by enabling the small and marginal farmers with farm mechanization for yield and productivity improvement.

The qualifying round of competition was inaugurated by Dr. Indre Mani, President, Indian Society of Agricultural Engineering & Head of Agricultural Engineering, ICAR, New Delhi as Chief Guest. Dr. Mani liked TIFAN concept very much and he encouraged all the young engineering students to solve the challenges of agricultural sector during his speech. He creatively coined the term ‘Engineering Agriculture’ to bring out an overwhelming change in Indian farming conditions. He also appreciated the efforts of



ONE OF THE TEAM'S PRESENTATION IN THE EVENT

TIFAN Organizing committee to conceptualize and executing this idea of competition.

TIFAN 2019 witnessed overwhelming response all over the India. Students from 37 colleges from 7 states across India participated in qualifying round. Most of the teams came up with new innovative designs for self-propelled onion harvester. Judges from different industries were very happy with the thought process from students and provided their valuable inputs for further improvements in the designs. The shortlisted colleges after this round will go for the final round where they have to demonstrate the physically build machines in the field. The final will be held at Mahatma Phule Krishi Vidyapeeth (MPKV), Rahuri.

Dignitaries present during the inauguration event were Mr. Sandeep Mahajan, General Manager, John Deere India and Convener TIFAN 2019; Mr. Sanjay Nibandhe, Chairman, SAEINDIA Western Section; Mr. Nilkanth Devshetwar, Head, Competency, Technology & Labs, John Deere India; Prof. Prakash Joshi, Founder, Joint Managing Trustee MAEER's MIT; Dr. D. D. Pawar, Associate Dean and Registrar, MPKV Rahuri; Mr. Mahesh Masurkar, Secretary, SAEINDIA Off-Highway Board; Mr. Amol Waghmode, from Cummins and Co-convener of TIFAN 2019; Mr. Narahari Wagh, Secretary SAEINDIA Western Section and Mr. Ramesh Pasarija, Deputy Director, SAEINDIA Western Section.

STUDENT CONVENTION, 01 NOVEMBER 2018, GHAZIABAD



DIGNATARIES OF THE FUNCTION

SAEINDIA Northern Section (SAEINS) conducted the Student Convention at KIET Group of Institutions Ghaziabad on 1st November, 2018. The convention was attended by different members of Northern Region (including IMSEC, AKGEC, KEC, etc.) The distinguished guests that attended the convention are, Mr. Sandeep Raina, Vice Chairman, SAEINS and VP – Engg, MSIL; Mr. Rakesh Sood, Vice Chairman, SAEINS and MD, Trim India; Mr. Anup Kacker, ED, SAEINS; Dr. Felix Regin A, AGM, MSIL; Mr. Sandeep Sharma, DGM-Corporate Technology, Minda Industries and Mr. Yogendra Singh Kushwah, Section Head, Subros.

Mr. Mahesh Munjal, CEO Majestic Auto congratulated the institute and the people of organising committee for organising the student convention. He acclaimed that these type of events provide a platform to students for showcasing talents. He also suggested that the educational institutes need to find the interest of the students in their respective fields so that the performance of the students can be enhanced in a particular field.

Mr. Sandeep Raina gave a little perspective of auto industry in the current scenario. He briefed that auto industry has an annual growth of 7-8 % annually and is the key industry contributing to growth of GDP of the country. He discussed about key challenges faced by automotive industry in view of safety and emission norms laid by government of India. Also the cost effective new technologies

are being developed by the automotive industry in this regard. He also told that SAEINDIA is a non-profit organisation and is a group of professionals who are voluntarily working together to exchange technical knowledge and also have a forum where the professional can exchange views with the students and try to bridge the gap between academia and industry.

Dr. (Col.) Amik Garg, Director, KIET briefed about the different events and delivered the vote of thanks. The various events conducted in the convention included are,

- Expert lecture series
- Technical Poster Presentation
- Technical Paper Presentation
- Project Exhibition

Expert lecture series was attended by more than 150 students and included the presentations from:

- Mr. Yogendra Singh Kushwah on “Mobility Engineering: Opportunities and Challenges”.
- Dr. Felix Regin A on “Aerodynamics & Aero acoustics Performance of Automotive Vehicle”.

In technical paper presentation a total of 19 technical papers were presented by different students.

- 1st Prize: Mr. Ayush Agarwal of KIET for “Modelling of Visual Performance in Mobile Environment”



GROUP PHOTO OF THE EVENT

- 2nd Prize: Mr. Rohan Singh of KIET for “Design, Analysis and Fabrication of a Reduction gearbox for an ATV”.

In technical poster presentation a total of 28 posters were presented by different students.

- 1st Prize: Mr. Aman Singh, Mohd Ahmad, Abhinav Biswas, Mirza Suhaib Beg from Team Maas, of IMS Engineering College for the poster “Hybrid Bicycle”.

- 2nd Prize: Mr. Shivank Bhardwaj, Malay Katiyar from the team Techbuddies, of KIET for the

In project Exhibition, a total of 24 projects were demonstrated by different students.

- 1st Prize: Mr. Suryansh Rathore from Team Intruders for the project “ATV Rover”.
- 2nd Prize: Mr. Ahsan Islam from the team Accelerators for the project “Go Kart”.

AWIM NATIONAL OLYMPICS, 22 - 24 DECEMBER 2018, CHANDIGARH

The 11th AWIM National Olympics was organised at Chitkara University, Chandigarh from 22nd to 24th Dec’18. First time AWIM has been organised jointly by both SAEINDIA Northern & Western sections together. The event was spaced out over three days starting with Inauguration ceremony on 22nd December, followed by the fabrication of toys and track event on 23rd December.

AWIM Nationals got overwhelming response from all SAEINDIA Sections covering 37 cities across India, an amalgamation of young spirits bubbling with energy and passion converged from Government administered schools to privately owned schools at Chandigarh to share com-

mon platform to exhibit talent. Gathering of 260 students from nearly 65 schools with Teachers and College volunteers comprising a team of 4 students, one teacher and one college volunteer.

Automotive leaders like Maruti Suzuki and Mahindra supported this event with more than 100 Industry volunteers coordinating various activities with the help of host “Chitkara University, Chandigarh. AWIM is a teacher-administered, industry volunteer assisted program that brings Science, Technology, Engineering and Math (STEM) education to life in the classroom for students in grade 5 and grade 6. Students learn practical application of laws of

SAEINDIA

News



DIGNITARIES OF THE FUNCTION

Physics while making AWIM Toys and also undergo experience of how to work in a team and execute projects.

The competition was divided into three main categories namely

- Fabrication of toys - where the students were allotted two hours to make toys and prepare oral presentation.
- Track events - the next step was to evaluate their toys on track for different parameters such as maximum distance, speed, accuracy, ability to carry weight etc.
- Presentation Round - The final step is to showcase their creative ideas via presentation which they have made emphasizing on Eco friendliness, safety features, social awareness Connected and Automated cars.

AWIM National Olympics commenced with the auspicious tradition of lamp lighting by all dignitaries. It was followed by a welcome address from Convener Mr. Alok Jaitley and words of wisdom from Chief Guest Dr.

Sarit K Das, Director, IIT Ropar and Ms. Archana Mantri of Chitkara university. On this occasion Convener Mr. Alok Jaitley congratulated all participants for making it to the National and said "AWIM is a great platform for you all to exhibit your talent and experience practical application of teaching at school. This experience will help you building an interest in technical field".

Chief Guest Dr. Sarit K Das motivated the students, he asked all to "Enjoy and have fun in next two days, Learning will come on its own, don't stress yourself with studies but innovate to do good in life".

On the concluding day, results were announced in the gracious presence of Chief Guest Dr. Bala Bharadvaj, President, SAEINDIA. He said "I am very much overwhelmed by seeing so much passion among Industry Volunteers, Organisers and all participant students. He highlighted that not only Automobiles but Aerospace can also excite you so enhance your horizon and excel.

Jet Toy Overall winner award went to "Modern



GROUP PHOTO OF THE EVENT

Education Society English Medium School” and Skimmer award went to “Swami Swarupanand Vidya Mandir, Pavas Ratnagiri”. First Runner up in Jet category was Tagore International School, Delhi and in skimmer category NMC School, Nasik. Event was widely covered in Print and electronic media namely “The Tribune, Punjab Kesari, Punjabi Tribune, Dainik and, Chardikala time TV, etc. Feedback was encouraging as summarized by Mr. Akshay Singla, MSIL “There is lot of potential

in the students who can do wonders if they are given correct guidance. AWIM event is a platform, where they learn teamwork, creativity, competition spirit.”

SAEINDIA thanked all sponsors who came forward to support AWIM namely Maruti Suzuki, Mahindra Rise, Chitkara University, Trim India, John Deere, Altair, Lumax, Uno Minda, ATS, IOCL, ARAI, iCAT, Polyplastics and Eaton.

AERO DESIGN CHALLENGE WORKSHOP, 22 - 23 DECEMBER 2018, CHENNAI

SAEINDIA Southern Section (SAEISS) conducted the Aero Design Challenge (ADC) workshop at Valliammai Engineering College, Chennai on 22nd & 23rd December 2018. Student members of SAEINDIA from various Engineering Institutions across India participated in the workshop.

In the inauguration, Dr. S. Senthilkumar, Champion-Aero Design Challenge (ADC) & Professor, Veltech University, Chennai welcomed the dignitaries and participants for the program and also gave a brief outline about the program. He graced the occasion and delivered a talk

about the importance of Unmanned Aerial Vehicle (UAV) and Aero Designing Challenge and their roles on societal applications.

He also explained how the UAVs developed by Madras Institute of Technology (MIT) team are helpful in many real time practical situations for the Tamilnadu police department and National Disaster Response Force (NDRF) India. The participants were inspired after seeing the video taken with the help of MIT-UAV during the flood situation in Chennai and how their UAVs saved many lives during that situation. He also emphasised the

SAEINDIA

News



STUDENTS DURING THE TRAINING SESSION

research opportunities in the field of UAV and its future challenges for constructive application.

Mr.C. Nandagopalan, Secretary, SAEINDIA Mahindra World City Division, talked about the evolution of SAE international and SAEINDIA and also highlighted the impact and outcome of SAEINDIA Aero Design Challenge. He motivated the students to take part in the continuous learning process through various SAEINDIA student activities. He also thanked Valliammai Engineering College for hosting the Aero Design Challenge workshop in their college and presented the memento to the host institution. All the dignitaries and the participants in the Aero Design Challenge stood up for the national anthem before the workshop.

After the basics, the students were explained about the Engineering Design and Fabrication Process of UAV by Dr. S. Senthilkumar along with Garuda Crew Members at Valliammai Engineering College. The students were also taught about propulsion system, avionics systems and

control surfaces of UAV. The students received their kits for making UAV and started their work on design and fabrication of aero model as per the instruction given by the trainers. All the UAV models designed and fabricated by the teams have been gone through pre-check carried out by the trainers and flyers before the flight test in order to have proper stability requirements.

On 23rd December 2018, all the teams have completed fabrication of their own UAV models, and then performed the flight test of their models successfully with the help of trainers and flyers at Valliammai Engineering College ground. The dynamic performances of the models were depending upon the accuracy in building the aero models. The students were happy as they could understand the fundamentals and design process of the UAV and all their models were flying successfully. They could also be able to understand and appreciate the importance of accuracy and role of each control surface for a successful flight of their models.



GROUP PHOTO - ONE OF THE EVENT

AURANGABAD DIVISION INAUGURATION, 21 JANUARY 2019, AURANGABAD



MoU SIGNING BY Mrs. RASHMI URDUHWARSHE, Sr. VP, SAEINDIA & Dr. UDAY B. SHINDE, PRINCIPAL, CSMSS

SAEINDIA Aurangabad Division was Inaugurated at the hands of Mrs. Rashmi Urduwarshe, Sr. Vice President, SAEINDIA & Director, ARAI at Chhtrapati Shahu Maharaj Shikshan Sansth's (CSMSS) Chh. Shahu College of Engineering (CSOCE), Aurangabad.

SAEINDIA would like to reach all the industry and academia members through its activities at sections and division levels. The Aurangabad Division Inauguration is one such forum for the Industry Members and Academia Members in and around Aurangabad. In this

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News

context we have already conducted a Tech Talk Lecture on “Sustainable Mobility & BSVI Challenges to OEMs & Suppliers” by Mr. M. K. Chaudhari for professional members and another Lecture on “Vehicle Architecture and Packaging Layouts” by Mr. Sanjay Nibandhe for academia members.

The CSMSS Chh. Shahu College of Engineering will support the SAEINDIA activities further to enhance SAEINDIA activities in Aurangabad Division, they have provided office space to run the divisional office. The MoU was signed by Mrs. Rashmi Urdhwareshe, Sr. Vice President, SAEINDIA & Dr. Uday B. Shinde, Principal, CSMSS, CSCOE in this regards.

To initiate the Division office, new Governing Board was formed. The board would initiate more activities further in Aurangabad Division. The first Governing Board Meeting was conducted in this regards. The meeting was chaired by Mrs. Rashmi Urdhwareshe, Sr. Vice President SAEINDIA & Director, ARAI; Mr. Sanjay Nibandhe,

Chairman, SAEINDIA Western Section & Dy. Director, ARAI; Mr. Narahari P. Wagh, Secretary, SAEINDIA Western Section and Director, Vector Engineering Solutions; Mr. Ramesh Pasarija, Deputy Director, SAEINDIA Western Section; Mr. Sagar Murugkar, Dy. Manager, SAEINDIA along with Members from Aurangabad division participated in both the Division Inauguration & Governing Board Meeting.

Mr. Ravindra Kharul, President & CTO, Endurance Technologies was nominated as Chairman of SAEINDIA Aurangabad Division. Further to the announcement of chairman of the division the following persons were also nominated as Dr. U.B. Shinde for the Vice Chairman Post; Prof. Pavan Chaudhari for the Secretary’s post and Ms. Anjali Vyavahare for Treasurer’s Post. The nominated all names were accepted unanimously by the members present in the meeting and confirmed.



DIGNITARIES FOR THE FIRST MEETING OF THE DIVISION



EMPOWERING MOBILITY THE SAFE AND INTELLIGENT WAY – SIAT 2019

The 16th edition of the Symposium on International Automotive Technology was bigger than ever – not just in size but also on the impact that displayed technologies will have on our automotive future.



NITIN GADKARI VISITED THE CHARGING STATION FOR ELECTRIC VEHICLES DEVELOPED BY ARAI

Once every two years the who's who of the automotive engineering world gathers for the Symposium on International Automotive Technology – not just to showcase the latest in their fields, but also discuss the future of the industry. Traditionally hosted by the Automotive Research Association of India on their premises, the event has grown bigger and stronger with time and for its 16th edition, SIAT 2019 was aptly moved to the Oxford Golf Resort on the outskirts of Pune. It proved to be an ominous decision considering the sheer attendance at the event over the three days that it was held from 16-18th January. The theme for this year was 'Empowering mobility the intelligent way' and the symposium brought to the fore innovative ideas and practical solutions in technology to meet future needs.

The three-day Symposium was inaugurated by Dr. A. R. Sihag – Secretary, Ministry of Heavy Industries. While addressing the gathering, Dr.Sihag said, "The ministry has envisaged setting up of 300 electric charging stations in the country with special focus on the Delhi - Jaipur - Agra triangle and the Mumbai - Pune corridor, with a capital investment of ₹ 35 crore. The initiative, a part of the Faster Adoption and Manufacturing of Hybrid and Electric Vehicles (FAME) - Phase 1, will be completed by the end of 2019." The Government is working as a facilitator to help accomplish India's '3/12/65 vision' as stated in the Automotive Mission Plan 2016-26 by creating supportive infrastructure for testing, homologation and research and development for the industry. "The mission envisages taking the Indian automotive industry to the world's top 3, increasing contribution to the country's GDP to 12 percent



SIAT Report



CHARGING STATION FOR ELECTRIC VEHICLES DEVELOPED BY ARAI

and reach a landmark of employing 65 million people,” he added.

In his speech, Dr. Bala Bharadvaj, President, SAEINDIA and Managing Director of aerospace giant Boeing’s India Engineering & Technology Center, said, “There are many parallels between the working of automobiles and airplanes and serious efforts to make flying automobiles are on.” Also present at the inauguration were Mrs. Rashmi Urdhwareshe, Chairperson - SIAT 2019 Advisory Committee, Sr.Vice President, SAEINDIA and Director, ARAI; Mr. Vikram Kirloskar, ARAI President, Chairman, SIAT 2019 Organizing Committee, and Vice Chairman, Toyota Kirloskar Motors Pvt. Ltd.; Mr. C.V. Raman, V.P., ARAI, and Sr. Executive Director, Engineering, Maruti Suzuki India Ltd.; Dr. David Schutt, CEO, SAE International; Neeti Sarkar, CEO, NATRIP and Mr. A.A. Badusha, Convener, SIAT 2019, of the Symposium among others.

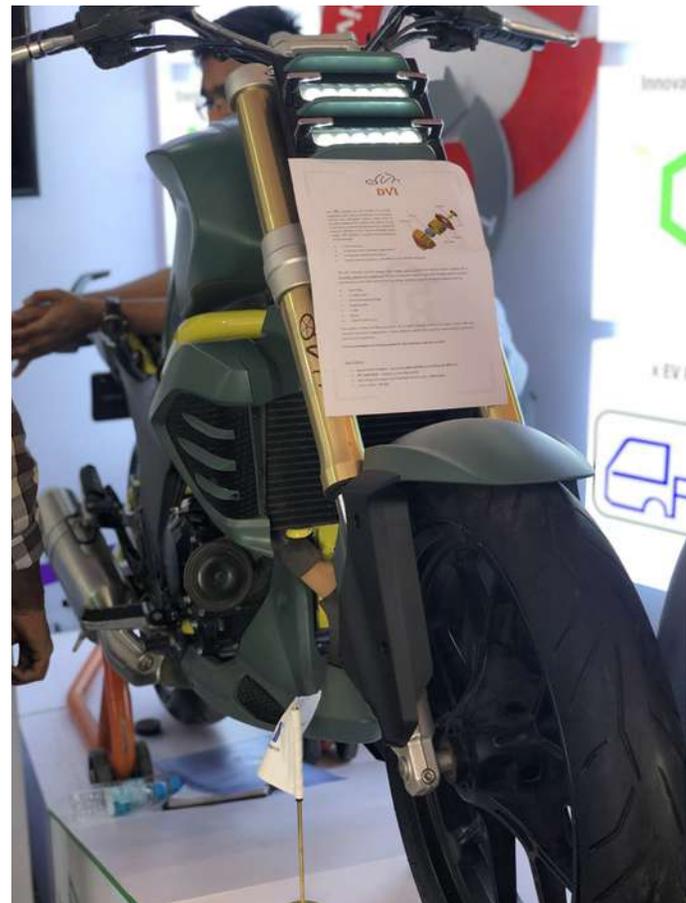
M15 Blending Program

During SIAT 2019, Union Minister for Road Transport and Highways, Nitin Gadkari announced the M15 Blending Program which aims at reducing the country’s dependence on oil imports and a move to optimal application of alternate fuels such as ethanol, methanol and bio-diesel. He stressed on the abundance of material in agriculture and other sectors which can work as feed stock for producing alternate fuels. The program essentially constitutes the blending of 15% methanol in petrol and is a project that the ARAI has been working on for the past few months already using BS-IV compliant vehicles. The M15

blend is basically 82% petrol, 3% additives and 15% methanol. Under ARAI’s tests the vehicles running on the M15 blend were found to be more fuel efficient as well as having significantly reduced emissions over a 3,000 kilometer test cycle.

Speaking about the M15 Blending Program, Prashant Guru Srinivas, of the Methanol Committee, NITI Aayog, stated that India must embrace methanol as it is cost-effective and can be made from high-ash content coal. He also went on to say that M15 has the potential to achieve up to 20% crude oil import substitution by 2030 – which is twice that of the targeted 10% as suggested by Prime Minister Narendra Modi. Biofuels could in fact constitute up to 20% of the total fuel mix in India by 2030.

Further adding, Nitin Gadkari announced an additional fleet of 40 Scania buses running on 100% bio-ethanol for the municipal corporations of Pune, Mumbai, Navi Mumbai and Guwahati under a new pilot project to study the impact of the fuel. He aims to increase the ethanol



MODIFIED MAHINDRA MOJO (Dvi)



WITH RICKSHAW THAT USES FUEL BLENDED WITH METHANOL

economy in India from ₹ 11,000 crore to ₹ 2 lakh crore.

ARAI mild hybrid technology for two and three wheelers

Prominently placed at ARAI's stall in the SIAT Expo was a vehicle that caught the attention of many – what looked like a slightly modified Mahindra Mojo motorcycle was in fact a display of technology that could revolutionise the two-wheeler industry. Aptly named 'Dvi' which is Sanskrit for 'Two', it runs a fully integrated mild hybrid powertrain with a P1 parallel coupling that replaces the starter circuit. ARAI claims that their mild hybrid powertrain provides twice the bottom-end torque and twice the city drive cycle efficiency while cutting emissions by half over a conventional powertrain. But the standout feature is actually its compact size and efficient space utilization which makes it ideal for use in both two and three wheelers.

The concept combines the high torque and silent operation of an electric motor with a powerful internal combus-

tion engine with the ability to shift between the two drives seamlessly – which in turn gives the vehicle a host of features such as Start-Stop, EV-only mode at low speeds, regeneration under engine braking, e-ride, boost for acceleration and even launch control among others. In its display form, the vehicle weighs in at 190kg, makes 20kW @ 7,500rpm and 30Nm @ 5,500rpm and uses a 0.36kW-hr battery pack with high charge-discharge rate and rated for over 1500 cycles. The setup enables performance akin to higher capacity motorcycles and ARAI is currently working on adapting the technology to commuter motorcycles as well.

Along with Dvi, ARAI also showcased chargers for electric vehicles that are compatible with major charging standards such as DC001, GB-T, CHAdeMO and CCS, along with an AC charger with Bharat Stage ports and RFID tags that has been indigenously developed for use by the general public.

SIAT Report

Continental Occupant Safety Monitor

Coming straight from German auto components major, Continental's Bangalore R&D centre, is an Occupant Safety Monitor (OcSM) developed by the recently formed Innovation Management team. The monitoring system uses cameras to visually assess occupant posture and optimize the deployment of airbags for better prevention of injuries in the event of a crash. The system basically analyses the occupants' posture (seat height, distance to the steering wheel, etc) in real time through an image processor and then AI algorithms send inputs to the airbag sensors to optimize deployment based on the posture detected and hence reduce injuries that may be caused by various instances – such as sitting too close to the steering wheel. The technology is being further developed by the Innovation Management group jointly with Continental's Artificial Intelligence and Robotics Labs that specializes in AI and machine learning. The system will also be able to detect objects in the occupant's hands and optimize airbag deployment accordingly.

FEV SVEN

This compact runabout was something of a showstopper at the SIAT Expo – developed based on a cooperative research program between the Aachen University of Applied Sciences (Germany), share2drive and the FEV Group, SVEN is a pure-electric, compact, three-seater city runabout. The zero-emission vehicle is just 2.5 metres long which gives it the ability to be parked diagonally without jutting out of designated parking spaces. With modern cities getting congested beyond belief, SVEN could be an intelligent solution for mobility in the future. As a car-sharing solution, this could also blur the line between public and private transportation quite significantly. SVEN is also extremely easy and intuitive to operate – with only eight buttons required to control it. There's an MLA projector as well, which can display information including battery charge status on the floor. The vehicle also adheres to the highest safety standards thanks to its applied Flexbody. SVEN will also be largely customizable for its users and future upgradation with autonomous capabilities are on the cards. The FEV SVEN will be displayed at the 2019 Geneva Motor Show after which it will begin commercial tests. Even in its current stage, OEMs are exploring the possibility of a version with higher seating capacities.



CONTINENTAL STALL AT SIAT 2019



FEV SVEN



DIGNITARIES AT SIAT EXPO



INTERVIEW: Mrs. RASHMI URDHWARESHE – DIRECTOR, ARAI



SIAT has grown leaps and bounds since it first began, to the tremendous scale it has reached in 2019. What according to you has been the biggest take-away from this year's event?

In my view we look at SIAT as a successful event when everybody feels part of it, and this time because the challenges were common, because the vision was very focused, the entire fraternity came together to discuss the problems at hand and to also plan for the future. That's what in my view is the biggest success of SIAT 2019.

ARAI has always been a hotbed of the best engineering minds in the country. How do you see it progressing in the world stage in the future?

ARAI is expanding its operations. It does not just address the R&D requirements in testing and homologation requirements but going beyond even the automotive sector, it plans to work for construction and mining, agriculture and also space and defense applications. From that point of view our skill development programs ad-

dress these requirements at the entry level itself. We also have a very structured way of preparing the young minds to take the challenges – not just technical challenges but so many other aspects – soft aspects of handling the challenges and handling the synergies of other institutes.

With technology rapidly evolving in the automotive world, do you think India is lagging in any area and what should be the most practical way forward?

India is in my view at the pace where we are identifying what are the gaps. There are gaps – I will not dare to say that India has everything, but the first step is to identify the gaps and plan for it in the future. Given the immediate task on hand, that is, the regulations coming upfront, I don't think that India has any liberty of planning and bridging those gaps in a very structured manner. So, we will hire services from outside – there will be synergies, not just within the country but also with global service providers and also government support to have a seamless agreement to address these demands.



BAJA

Report

ADVENTURE RELOADED: BAJA SAEINDIA 2019

The first round of the 12th edition of BAJA SAEINDIA has concluded in Pithampur with huge participation in both mBaja and eBaja categories



START OF RACE - CHEQUERED FLAG - BAJA SAEINDIA 2019

A grueling off-road course with every kind of obstacle thrown in; purpose-built machines competing for four hours straight; and the ultimate prize for those that come shining on top – sounds like a running of the Dakar Rally, doesn't it? But when the manpower involved right from the design of these machines to building and racing them is made entirely of college students, you know it stands for more than just a winner's trophy! BAJA SAEINDIA 2019 had all this and a whole lot more as it went into its 12th edition at NATRiP's facility in Pithampur, Indore late in January. With every iteration of the event it has seen participation increase and this year was no different.

Over 4000 students from various engineering colleges across the country converged in Indore to pit their machines against each other and get a crack at placements in the top industry conglomerates present at the venue. While mBaja – powered by conventional engines has always seen massive participation, its electric counterpart – eBaja wasn't too far behind this year. A total of 363 teams

registered for the 2019 edition, with 251 of them qualifying for the finale – four days of testing on various levels running up to the tremendously exciting Endurance event.

Teams from the participating colleges have to first design and build their off-road Baja buggies with no external help (including fabrication) after which they're put through a series of both static and dynamic tests. Static testing accounts for factors such as cost, innovation in technology and safety while the dynamic tests put the vehicles through traction, acceleration and maneuverability scenarios. While the powertrain itself is outsourced, students have the freedom to design and build their own braking, transmission and suspension systems, while keeping vehicle speed restricted to 60kmph. Once the static and dynamic tests are through, qualifying teams move on to the Endurance Round – for 2019, 107 teams made it there out of which 85 were for mBaja and 22 for eBaja.

The endurance event was flagged off by Mr. Bharat Moossaddee, EVP & CFO, Auto Sector, M&M Ltd. along with

BAJA Report



NIRMA-eBAJA WINNER

Mr. Umesh Shah, Sr. VP & COO (CVRBU), Gabriel India Ltd., Convener - BAJA SAEINDIA 2019, Mr. Rakesh Sood, MD, Trim India, & Dr. K.C. Vora, Sr. Advisor, BAJA SAEINDIA and Sr. Deputy Director, ARAI. The start of the endurance event is always chaos with all qualifying teams lining up for the start, and once they go through, they have to navigate a tricky 4.5 kilometre off-road track with steep drops and climbs, slush, water crossings, ruts and ridges and a ruthless rock crawl as well.

The mBaja buggies had to complete four hours of this test while the eBaja teams had to endure two hours. This is where BAJA SAEINDIA really sets the tone for the event – students are made to tackle real world scenarios with these vehicles, bringing them from the classroom to a more practical, industry level. The students have to design for reliability and performance of not just the engine, but the chassis and suspension components as well.

At the end of it all, it was Govt. College of Engineering, Pune's Team Nemesis Racing that took the top step of the podium in the mBaja event – making this the seventh year in a row that they've won at BAJA SAEINDIA. D Y Patil College from Akurdi, Pune took second place while Silver Oak College of Engineering came in third for mBaja. Top honours in eBaja went to Institute of Technology, Nirma

University from Ahmedabad with BVB College of Engineering, Hubli in second.

Speaking about the event, Dr. Pawan Goenka – Managing Director, Mahindra & Mahindra Ltd said, "BAJA SAEINDIA has grown from strength-to-strength over the last twelve years and it is no surprise that this year's edition has been bigger and better than ever before. The success of this unique initiative lies in nurturing our budding engineering talent and equipping them to apply the concepts they learn in the classroom in real world situations. By staying relevant and keeping updated with the changes in the automotive industry, BAJA SAEINDIA has played a distinct and encouraging role in nurturing automotive talent."

Mr. Umesh Shah, said, "The BAJA SAEINDIA aims to provide the engineering talent an environment that encourages them not just to learn but also grow through practical hands-on experience. Faced with the unconventional challenges that the BAJA SAEINDIA has come to be known for students are forced to come up with unconventional solutions which then spurs innovation. It is with this objective that we supported BAJA SAEINDIA all these years so that engineering students can innovate and come up with practical solutions for various issues facing the industry and society."

BAJA Report



COEP, mBAJA WINNER

There were also various other awards presented to the teams for static events. MIT, Pune and Shri Vishnu Engineering College of Women from Bhimavaram, AP bagged the Engineering Design award for mBAJA and eBAJA respectively. NIT Jamshedpur won the Go Green-Emissions Award. Institute of Technology, Nirma University (Ahmedabad) was declared the Best eBaja Team while Govt. College of Engineering, Pune was declared the Best mBaja Team as well. In all, a total prize amount of ₹ 32 lakhs was handed to the various winners for BAJA SAEINDIA 2019 Pithampur.

BAJA SAEINDIA 2019, Pithampur was the 1st round of the event which will now be followed by the 2nd round at IIT Ropar between 8-10 March. There are even talks of a 3rd round possibly being planned in Chennai later in the year to encourage even more colleges to participate – especially from the southern states. The event isn't just a triumph for the students though – it opens avenues for the automotive industry to hire budding talent and nourish it for a brighter motoring future. BAJA SAEINDIA 2019 was supported by Mahindra & Mahindra as the title sponsor with additional support coming in from big names such as ARAI, Altair, Anand Automotives, Ansys, AVL, Bharat Petroleum, BKT, Bosch, Briggs & Stratton, Chitkara

University, Continental, Compag Automation Systems Pvt Ltd., Cummins, Eleation, Faurecia, GM, IAC, iCAT, ITW Chemin, IIT Ropar, IIST, Lear, L&T, LNCT, Math Works, Medanta Hospital, MP Consulting, MSC Software, MY FM, NATRiP, OYO Rooms, Padmini Engineering, Power Equipment, Trim India Pvt. Ltd., Radisson Hotels, TFM, Think Creative Solutions Ltd., Varroc and V J Production.

Muntaser Mirkar



END OF RACE - CHEQUERED FLAG - BAJA SAEINDIA 2019

FATIGUE IN AIRCRAFT STRUCTURE

Introduction:

The enigma with the modern commercial aviation is that it is more reliable and safer than the other modes of transportation. One of the reasons for this is the rigorous intensified investigation and implementation of the learnings by the commercial aviation fraternity after every commercial aviation mishap, no matter how small or big the catastrophe is.

In 1954 two Comet aircrafts suffered pressurized cabin disintegration resulting from fatigue. Investigation and follow-up gave a general awareness of finite fatigue lives, the significance of Fail-Safety, and the usefulness of full-scale fatigue testing (FSFT). This investigation led to the importance of fatigue for the durability of the aero-structures. Till this, fatigue was restricted only to rotating components i.e. railway axles etc.

Ongoing fatigue research aims to improve structural analysis capabilities which arose due to inadequate actual data for short crack growth which is no longer the case owing to advances in qualitative fractography and methods for fatigue life and crack growth predictions. Reliable and robust analytical methods/mathematical models for short fatigue crack growth and inclusion of corrosion and temperature effect to fatigue life assessment are the need of the day for the design of more optimal and efficient aerostructures. In the absence of the above, mere conservative factors are currently being used to envelop the uncertainties and are leading to colossal design having much potential for optimum

and efficient structure.

Evolution of Fatigue requirements for Aerostructures

Post 1950s, the American certification agency Federal Aviation Administration (FAA), strengthens its regulation by adding CS/FAR 25.571 (Certification Specification / Federal Aviation Regulation -Fatigue evaluation) to its regulatory requirements, which says, "An evaluation of the strength, detail design and fabrication must show that catastrophic failure due to fatigue, corrosion, or accidental damage, will be avoided throughout the operational life of the aero plane".

The recent amendment -19 (May 2017) of CS 25.571 says, "An LOV (Limit Of Validity) must be established that corresponds to the period of time, stated as a number of total accumulated flight cycles or flight hours or both, for which it has been demonstrated by full-scale fatigue test evidence that widespread fatigue damage will not occur in the aeroplane structure".

The former requirements were met by development of Fail-Safe and Damage Tolerant design methods. Fail-Safe design principles (Multiple load paths) mean that major parts of the structure are designed firstly to achieve a satisfactory fatigue life with no significant cracking. Secondly, the structure is also designed to be inspectable in service and able to sustain significant and easily detectable damage before safety is compromised.

Continuing developments

The Fig: 1 (Per Ref:1) depicts evolution of commercial

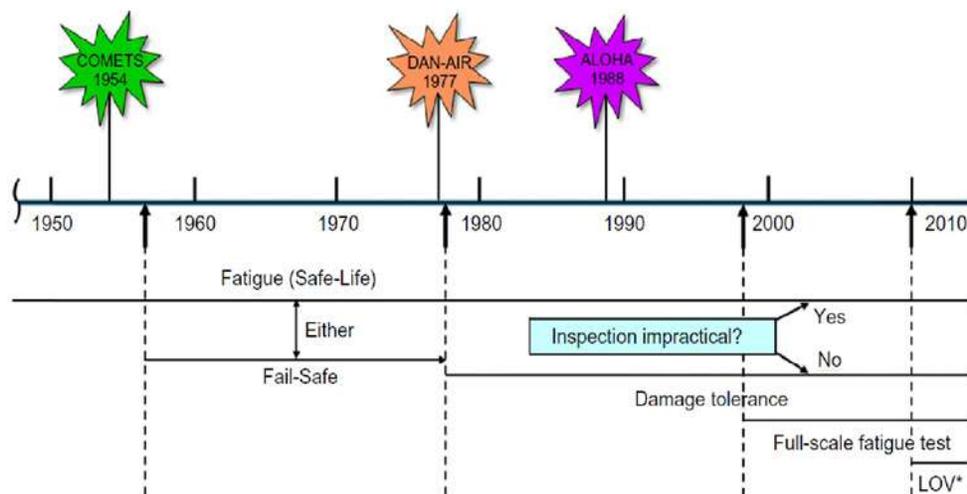


Fig: 1 IMAGE COURTESY: NASA - SPACE HUMAN FACTORS AND HABITABILITY ELEMENT TRAINING.



TECHNOLOGY Update

aviation fatigue requirements since 1950 to till date; from safe-life to damage tolerant structure and to Full-Scale fatigue test and Limit Of Validity (LOV). The current developments are in:

1. Fatigue Analyses Methods and
2. Airframe materials that have implications for future aircraft structural integrity requirements.

The Fig: 1 (Per Ref:1) highlights the important three commercial aviation accidents which has a major role in evolution of fatigue requirements. The important incidences/learning from these are listed below:

De Havilland Comet: This catastrophe brought out the importance of cyclic loading and stress concentration factor.

DAN-AIR Boeing 707 aircraft: This incidence thought us the importance of inspection and inadequate consideration of design criteria.

ALOHA Boeing 737 aircraft: This disaster put light on effect of corrosion on fatigue life.

Henceforth, all research and developments are pivotal around; inclusion of effect of corrosion for evaluation of fatigue life, inspection interval and design of structure with reduced stress concentration effect.

Fatigue Analyses for Conventional Alloys

Ongoing research aims to improve structural analysis capabilities and methods for fatigue life and crack growth predictions.

Two of the main developments are -

1. The study of short fatigue crack growth

Very small cracks of the size of 0.0006 to 0.5mm are termed as short cracks. With the current methods/mathematical models there is a challenge in assessing the crack growth rate of these short cracks.

The small pre-existing defects (referred to as short cracks) are an inherent feature of engineering components and structures. They may be formed as a result of material forming and fabrication. The recent evolution of data for early crack growth in high performance aircraft, analysis methods have been developed to use these data for life predictions and reassessments.

2. The possible and actual effects of corrosion on fatigue and the combined action of corrosion and fatigue

Recently there has been much effort to develop life-prediction models combining corrosion and fatigue. At present the question whether corrosion and fatigue act in combination or independently requires further investigation. This issue is important since it can have a major impact on service life management.

Airframe Materials

Aluminum alloys have predominated in airframes since the early days of commercial aviation. Lately, driven by the demand for fuel-efficient, light-weight, and high-stiffness structures that have fatigue durability and corrosion resistance, composites, Carbon Fiber Reinforced Plastic (CFRP) have replaced aluminum for certain applications.

Aluminum alloys still account for about 60% of the airframe structural weight, with the notable exceptions for very recent aircrafts like Boeing 787 Dreamliner and Airbus A350 XWB, which use 50%–53% composites and only 19%–20% aluminum.

The structural integrity implications of using the newer materials are summarized here

GLARE (Glass Reinforced Aluminum laminates) is a composite used extensively in the Airbus A380 pressure cabin. GLARE has fatigue and fracture properties amenable to conventional analyses for all-metal airframes, although there are some differences.

CFRPs have high fatigue resistance when free from defects and stress concentrations, but they are susceptible to impact damage and subsequent cracking and delamination.

The grey areas of CFRPs are:

1. Damage growth is difficult to predict.
2. Inspection reliability challenge and
3. Difficulties in analyzing complex components to predict the onset of failure.

Currently these grey areas are overcome by overdesigning CFRPs according to the 'no growth' Damage T principle. Per CS/FAR 20.107B which

TECHNOLOGY Update

regulates fatigue criteria for composite structures, 'No growth' approach is a method that requires demonstration that the structure, with defined flaws present, is able to withstand appropriate repeated loads without detrimental flaw growth for the life of the structure. Since much of the fatigue properties of the composites to be explored there lies scope for further developments in composite fatigue analysis methods.

Current Research Areas

Following are the recent trends for the advancement of fatigue life assessment:

Full Scale Fatigue Testing (FSFT) programme for CFRP: Evolution of FSFT programme for advance materials including the effects of temperature and humidity on the properties.

Mathematical Modelling of fatigue assessment for advance materials: Evolution of robust mathematical models for the advanced materials including the effect of corrosion.

Scatter Analysis for advanced materials: Recently FAA funded scatter analysis on several composite material test databases representing multiple batches, loading modes, environments, and laminate stacking sequences, which has shown that fatigue-life scatter have been reduced significantly. These improvements have a direct impact on the probabilistic or reliability-based analysis techniques for predicting the life of a composite structure.

The primary goal in scatter analysis of composites is to interpret the variability (uncertainties) in data in lower levels of the building blocks of testing and translate the statistical significance of such phenomenon into full-scale test substantiation.

The Federal Aviation Administration (FAA) actively sponsors research in structural substantiation, Damage Tolerance, Maintenance practices, advanced material forms and processes.

These activities continually apprise the safety and certification requirements for composite structures.

Following are the current road blocks

High cost involvement in FSFT programme for advanced materials. Need to further explore for cost effectiveness.

Efficient inspection techniques in terms of crack detectability, cost and time are the need of the hour.

Evolution of mathematical models for the inclusion of effect of corrosion for fatigue evaluation instead of merely using conservative factors.

Summary

The fatigue requirements for aircraft structures have evolved since the 1950s. However, this has not been a gradual process: 'milestone' accidents have caused paradigm shifts. Continuous development of fatigue analysis methods and advanced materials will help in adhering to rapidly evolving requirement and will take commercial aviation to next level of reliability and durability.

In the recent past there is no catastrophe due to fatigue damage, since it is taken care extensively in the design. But the scope for the optimum and efficient structures still exists, since to envelope uncertainties that exists in advanced material and manufacturing mere conservative factors are being used.

For the advent of efficient and optimum structure there is need to evolve matured mathematical model, inspection techniques for advanced material and 3D manufacturing such as composites and 3D printing.

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Report on Determining the Fatigue Life of Composite Aircraft Structures Using Life and Load-Enhancement Factors - June 2011

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TECHNOLOGY

Update

DEVELOPMENT AND VERIFICATION OF AIR-CONDITIONING SYSTEM FOR PREMIUM BUSES

Air-conditioning has become a prominent feature in premium segment buses for over a decade now. It has undergone many changes as and when the demand for passenger comfort in public transport industry has come up. Air-conditioning is a critical topic influencing the passenger comfort in most of the mass transit vehicles. Transit buses operate in diversified weather conditions especially in India, which impose challenge to a single air-conditioning system fitted onto the bus to provide the right air-conditioning, so that passenger comfort will not be compromised. Air-conditioning system has positively increased the comfort level of passengers irrespective of hauling distance or its application for city or intercity transits. Selecting a right air-conditioning system for bus application plays a major role in addressing the passenger comfort topic in a broader perspective. This article discusses those important areas which directly impacts the passenger comfort in transit application.

Background

Development of Air-conditioning system for vehicles has transformed the passenger cabin from non-comfort to comfort zone while commuting in hot weather conditions. The very first attempt to develop a mechanical cooling system for a vehicle was done by William Whiteley, who in 1884 suggested placing blocks of ice in trays under horse-drawn carriages and blowing air inside by attaching a fan to the axle. The only way to keep closed-body automobile cool prior to this concept was to adjust the windshield that opened vertically or to remove the side curtains and/or to crank windows up and down for the desired airflow. Also, vents under the dashboard facilitated air circulation. The opening of the windshield was restricted so that the passenger compartment was sufficiently pressurised while minimising infiltration of the hot air from the engine. Based on number of studies with respect to historical advances in air-conditioning systems, the very first factory installed air-conditioning system was by Packard cars in 1940. Developments following the advent of air-conditioning systems has led to worldwide usage in automobile passenger comfort.

What is Air-conditioning?

The process capable of filtering air while controlling the humidity and temperature at desired level in target spaces/ passenger cabin (in bus body) is called an Air-conditioning system. The process typically helps to maintain required level of comfort for passengers or occupants in the desired conditioned zone.

Purpose of Air-conditioning in Buses

Providing Air-conditioning in buses provides better thermal environment for passengers while travelling by improving quality of air through filtration and helps in creating a desired thermalzone.

Major components of Air-conditioning System

- Compressor- Refrigerant comes into the compressor as low-pressure gas which is compressed and moves out as high-pressure gas.
- Condenser - The high-pressure gas from compressor flows into condenser where it is condensed into liquid, by giving off its heat to outside air.
- Expansion Valve -The high-pressure liquid from condenser moves to expansion valve where the valve restricts liquid flow and lowers its pressure.
- Evaporator - The low-pressure liquid finally enters into evaporator where heat from target space is absorbed and changes its phase from liquid to gas.

Principle - Vapour Compression Cycle

Most common type of refrigeration cycle used in Air-conditioning application is 'Vapour compression cycle'. This refrigeration cycle takes place in four stages:

Isentropic Compression (Compressor)

Constant pressure heat rejection (Condenser)

Isentropic Expansion (Expansion Valve/Orifice)

Constant pressure heat addition (Evaporator)

Refrigerants

The refrigerant is a substance used in Air-conditioning units generally in its liquid state as heat exchanger. The refrigerant experience change of phases during the refrigeration cycle from liquid to gaseous and viceversa

TECHNOLOGY Update

as a heat carrier. Most commonly used refrigerant in bus Air-conditioning application is R134a (Tetrafluoroethane from HFC family).

Desirable properties of a refrigerant

- Low Boiling Point: The refrigerant should be able to change from liquid to vapour at very low temperature.
- Low Specific Volume: Refrigerant should be capable of occupying less space at its vapour state so the components of Air-conditioning can be made compact in design.
- High Specific Enthalpy of Vaporisation (Latent Heat): Refrigerant should be able to absorb more heat with less volume in its vapour state or there will be increase in mass flow rate of refrigerant.
- High Critical Temperature: Refrigerant should have high critical point to allow refrigerant to convert from vapour to liquid easily.
- Non-Corrosive: Refrigerant should be highly non-corrosive to metals used in Air-conditioning components to avoid damage.
- Non-Flammable/Explosive: Refrigerant should be highly non-flammable/explosive under any operating condition.
- Environmental Friendly: Any refrigerants used in Air-conditioning are highly recommended to be environmental friendly to avoid any sort of damage caused for the eco-system by refrigerant leakage/open storage. (As commonly known, the ban on CFC's for its adverse effect on ozone)

Selection Criteria

Technical Requirement

A document which is prepared before starting the actual development process, containing details onto requirements to develop the product, foreseen risks to be considered, aspects onto performance, reliability, efficiency, V&V and also describes how the final product will be like.

Following are some major requirements to be defined before moving to development phase of Air-conditioning unit for bus application:

- Type of Vehicle

- Passenger Capacity
- Vehicle Length
- Arch radius of bus roof
- Engine Configuration
- Compressor Configuration
- Engine and Compressor Pulley details
- Position/Arrangement of Condenser and Evaporator
- Pipes and Harness Routing and Position
- Fans, Blower type and requirement
- Fresh air intake % requirements
- Type of AC system preferred
- DVP
- RT
- Operating Life
- Service and Spare part demands

Human Comfort

Human comfort can be defined as zone or psychological state where a person feels comfortable against range of parameters such as temperature, humidity and air flow.

Major factors affecting human comfort factors are:

- Temperature: The intensity of heat present in the object/occupant
- Humidity: Quantity presenting the amount of water vapour in the atmosphere
- Air Purity: Composition of air in terms of achieving human comfort

Research on human comfort says most humans feel comfort when air temperature is between 22°C to 26°C and humidity ranging from 40 to 60%. The temperature range may increase with very hot ambient condition.

Design and Development Process

The main aim of this step is to collectively address the design requirement and to define/create a process flow which aims to manufacture a product with high quality and minimal faults. Defining a good development process and front loading all the design requirement helps in manufacturing a complete product with no/minimal rejection rates or helps in choosing a right product for once requirement. The design requirement



TECHNOLOGY

Update

includes pull-down test criteria, technical requirement, operating environment and other specific tests based on requirement.

Heat Load Calculation

Heat load calculation helps in determining the amount of energy to be added or removed from the target space in order to achieve the desired comfort condition. Heat load is classified into two groups Sensible and Latent heat load.

Factors to be considered to calculate heat load are:

Step 1: Solar heat gain

Solar heat gain is defined as increase in heat load of a space or closed envelope when heat is absorbed by bus body such as roof, side walls, cabin floor, side window and other glass area due to incident of solar radiation.

Step 2: Sensible heat gain

The thermodynamic state of an object/liquid where it is subjected to temperature changes without any change in phase.

Step 3: Latent heat gain

The thermodynamic state of an object/liquid where it is subjected to temperature changes with change in phase.

Step 4: Total heat gain

Total Heat Gain = Sensible Heat Gain + Latent Heat Gain.

Thermal Insulation

Thermal insulation plays a major role in suppressing the addition of heat from outer atmosphere to target space. Choosing a right insulation material for Air-conditioning application in bus body not only improves the resistance to heat addition to target space but also improves the thermal comfort for passengers. It is always recommended to have proper insulation inside the duct so that the temperature difference in air stream coming out of evaporator blower and the air stream at the duct ends should be less than 20°C. This reduces the effort required by Air-conditioning unit to cool the target space, thus helping in low power consumption of Air-conditioning unit from the engine.

CFD

Computational Fluid Dynamics (CFD) is a well-known technology which helps in effective analysis of fluid flow

in Air-conditioning system. The tool or the software allows one to simulate the model and helps in pre-defining the flow characteristics of fluid in target area such as velocity, density, thermal impact in any given region inside the target area enabling the engineer to analyse the problem prior to its occurrence and give the best possible solution for better performance of the system. This additionally helps engineers to develop energy efficient system delivering comfortable environment at low product cost. Using simulation model for fluid flow analysis in Air-conditioning system helps in testing the design before actual construction, which reassures the design with minimal iteration.

Design Verification

The importance of Design Verification is that, it helps in ensuring the design of a product is as per the pre-defined requirements. Design Verification can include different kind of test procedures for verification such as Simulation of product in system, Physical inspection of finished product, Analysis through mathematical model and/or defining specific test method as per product functionality. Many times, combination of verification methods will be used to execute verification of product. Most important thing is identifying the set of verification activities that need to be carried out on the product which helps to conclude that the developed product is right for usage.

Following are the verifications to be done on Air-conditioning components while in development stage:

- Vibration Test for critical components
- Corrosion Test for components exposed to atmosphere and liquid
- Verification of belt calculation
- Belt tension test
- Belt slippage test
- Belt life verification for pulley
- Burst pressure test for all connecting pipes, hoses and joints
- Life of Condenser fans and evaporator blower
- Magnetic clutch life verification used in compressor
- Compressor area operating temperature measurement and verification of components

TECHNOLOGY Update

operating temperature

- Compressor movement envelop while in operating condition
- Roof Air conditioning unit weigh & CG verification
- Current rating & consumption calculation
- Air-conditioning Pull down test

Verification and Validation

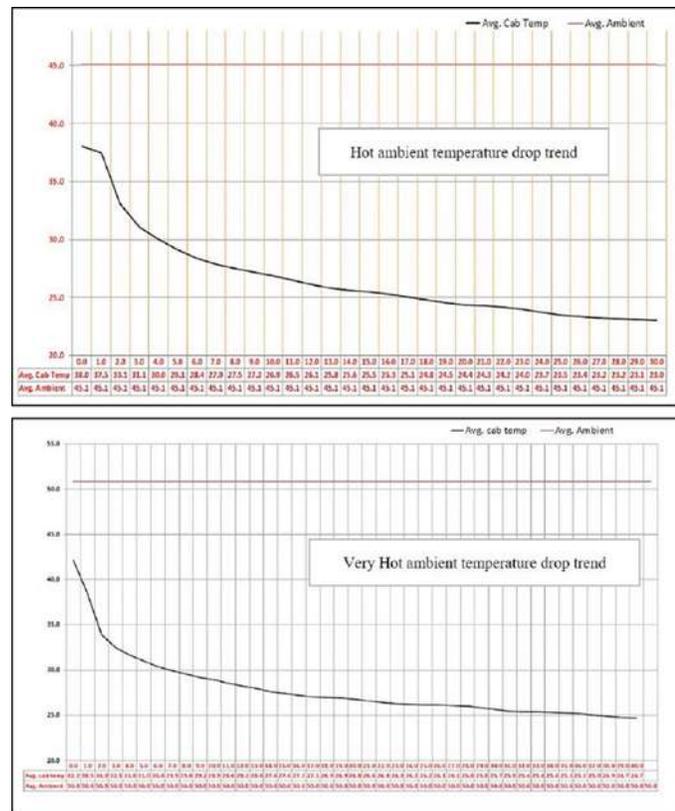
Verification and Validation combined evaluates the developed product against the entire specific requirement put forward for its development. This step contains detailed procedure for conducting of test process on product, method to capture data and interpretation of result in desirable/acceptable format for evaluation. The main test conducted on bus Air-conditioning is the "Air-conditioning pull down test". AC pull down test is a procedure to verify the performance of the Air-conditioning unit used or recommended for the bus application against a given set of parameters such as: Ambient temperature to required temperature, time taken for cooling, ΔT expected to achieve and many more. Below procedure explains how to conduct pull down test on buses, capture data and interpret the result.

Thermocouple Placement Layout

AC Pull down Test

AC pull down test is carried out in two stages:

1. Static Pull down test: This test is performed on bus in parked condition under set parameters to evaluate the system performance as per supplier data. Following



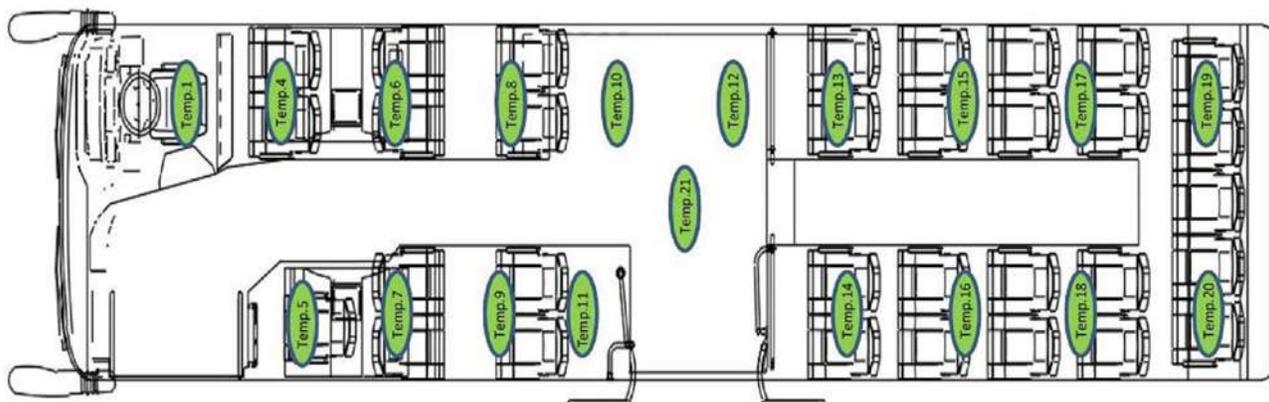
RESULT

steps shows how to perform static pull down test.

Park the bus for one hour under direct sunlight in an open field with no shade. Note down the ambient and cabin temperature, humidity and start time of test.

At the end of this period, start the bus and run the compressor at its rated RPM and switch ON the AC keeping blowers at its full speed condition.

Run the system till the cabin temperature comes down



THERMOCOUPLE PLACEMENT



TECHNOLOGY

Update

to expected/defined temperature zone in test code, note down the close time.

2. Dynamic Pull down Test: Dynamic test is performed on bus in running condition. Dynamic test on bus is done to simulate the Air-conditioning performance in real time scenarios.

Park the bus for one hour under direct sunlight in an open field with no shade. Note down the ambient and cabin temperature, humidity and start time of test. It is good to choose a straight long route, with minimal interruption and stoppages.

After this is complete run the bus at desired speed w.r.t rated RPM in the selected route.

Keep the AC in ON condition and blowers at its maximum speed throughout the test.

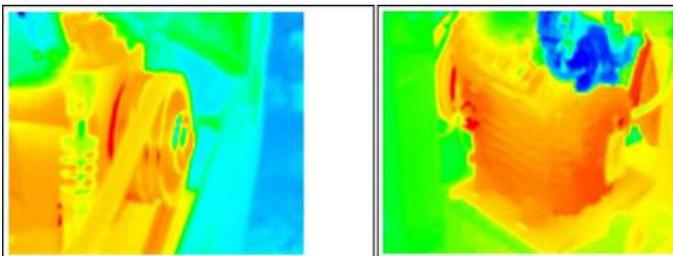
End the test once desired route selected for dynamic test is completed.

During the test parameters such as temperature, air velocity at vents, humidity to be captured. Below image shows one such example of AC pulldown test.

The above shown trend of temperature decrease in passenger salon area is observed when ambient temperature varies from hot ambient or very hot ambient condition. A minimum temperature drop of 15 - 18°C to be achieved in first 30 min of test, as recommended by system manufacturers which can be clearly seen in test result. The temperature drop trend will increase with lower ambient and salon temperature for different scenario.

Thermal image of compressor after the completion of pull don test

It is important to note the temperature developed in and around the compressor. In order to evaluate the compressor child parts, accessories, pressure switches,



THERMAL IMAGE OF COMPRESSOR

rubber buses and other parts are developed for the operating temperature recorded in the extreme hot climates in the engine compartment. Also the same details will be an input to airconditioning manufacturers for selection of compressor and clutch accordingly. During the static test the high pressure and low pressure of the system should be recorded to ensure the system is working within the pressure limits.

Summary:

This article states general procedure to select and validate performance of Air-conditioning system and ensure desired interior climate. The cooling performance of the system greatly depends on the external factors like ambient temperature, salon temperature, vehicle insulation, Air-conditioning system capacity, air flow control, ducts, refrigerant capacity, engine rpm, vehicle speed, operating condition, seating capacity, vehicle length and many more. Result obtained on a bus with a particular system holds good to only that particular system combination, and whenever there is any modification to system or onto bus, the validation has to be re-done to obtain actual performance of the Air-conditioning unit. The verification procedure or performance defining criteria for air-conditioning system may vary from one manufacturer to another based on the system architecture and manufacturers recommendation.

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REDUCE COSTS AND MAXIMIZE EFFICIENCY IN MD AND HD ENGINES

In order to reduce fuel consumption, engine manufacturers are using advanced boosting systems, electrification and waste recovery technologies to downsize and down-speed engines.

Forschungsgesellschaft für Energietechnik und Verbrennungsmotoren (FEV) recently developed a new technology – the ITES system (Integrated Turbine, Electrification and Supercharging System). This system integrates turbo-compounding, electrification and supercharging into one auxiliary component of a medium- or heavy-duty engine. The unit integrates a turbo-compound turbine, a centrifugal compressor and an electric motor-generator over a planetary gear set and is mechanically connected to the engine crankshaft via a clutch. (FEV was founded in 1978 as a privately held company by Prof. Franz Pischinger who, at the time, headed the Institute for Applied Thermodynamics at the Technical University of Aachen).

This approach reduces cost and required space and provides an increase in engine efficiency when compared to the independent integration of each of these technologies. FEV predicts up to 15% fuel economy improvement for a medium-duty truck on an FTP certification cycle with a downsized engine and the

ITES system.

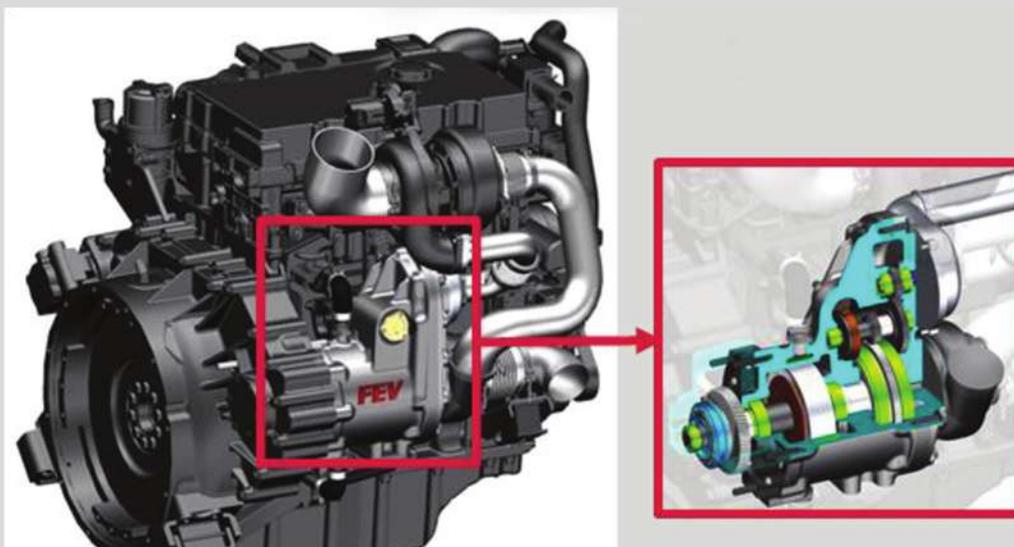
During a 60-minute webinar, Satyum Joshi, Senior Engineer of Commercial Engines at FEV North America Inc., discussed the technical aspects of the ITES system and importance of developing fuel-efficient components and at the end of the webinar, answered specific questions from participants.

Excerpts from Satyum Joshi's presentation:

Engine efficiency and cost trade-off:

Various factors impact increase in engine efficiency however the prime movers have always been regulations and customer requirements – market competition, rise of electrification, oil prices, customer requirements and government regulations.

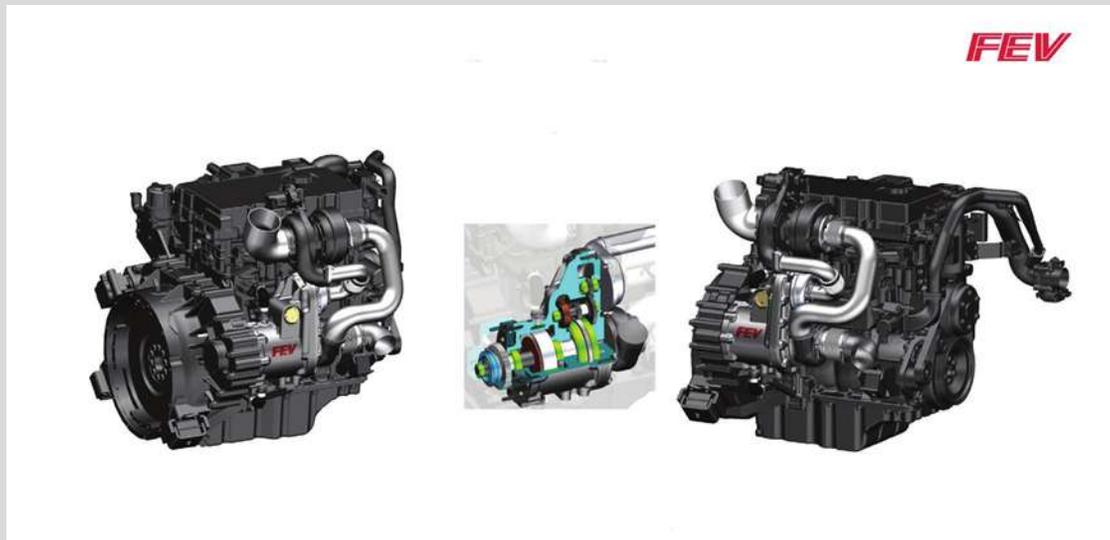
Engine commonisation for cost reduction and future NOx regulations may drive further increase in engine efficiency than those set by engine specific regulations. How do we increase engine efficiency, and at what cost? Affordability is the key.



ITES SYSTEM

TECHNOLOGY

Report



ITES SYSTEM

ITES System:

Motivation: Engine downsizing with E-booster can enable 6% increase in engine efficiency while maintaining transient engine performance of a Medium Duty (MD) engine. 200 rpm engine downspeeding with E-booster can increase engine efficiency by an average of 4% and reduce transient emissions on MD engine.

Mechanical turbocompounding can improve engine efficiency at higher engine speed and loads by 2% on a MD engine. Up to 16% benefit in vehicle fuel economy can be realised with 48v PO architecture mild hybridisation on Light Duty (LD) application (8500 lb GVWR).

How can we integrate the technologies that have a significant potential in increasing engine efficiency while addressing their integration challenges? FEV's Integrated Turbine, Electrification and Supercharging System (ITES) integrates technologies while minimizing and maximizing efficiency.

Technology description: The basic concept of ITES is to integrate a secondary compressor, turbocompound or ORC turbine, motor-generator unit over a planetary gear set. ITES operated in 4 different modes in specific regions of the engine map to maximise engine efficiency gains with each technology.

MD application: ITES applied on medium heavy-duty engine installed in a class 6-7 vocational

application, enabled an average of 8% reduction in engine fuel consumption on the downsized engine in comparison to the baseline engine. Baseline 6-cylinder engine was downsized to a 4-cylinder engine and integrated independently with E-booster, Mechanical Turbocompounding and Bit-Search Generator (BSG) for comparison with ITES. In comparison to independent integration, ITES provides higher efficiency improvement along with the advantage of lower cost and package size. ITES analysis on engine test cycles for on-highway and off-highway MD application noted up to 13% reduction in fuel consumption. ITES can enable 11% increase in vehicle fuel economy of class 6-7 vocational truck on Air Resources Board (ARB) transient cycle.

HD application: ITES implemented on a HD engine with ORC turbine expander for class 8 tractor application. ITES enabled powerdense engine with Organic Rankine Cycle (ORC) system to achieve an average of 5% reduction in Brake Specific Fuel Consumption (BSFC) on the engine map in comparison to baseline engine. Up to 1% increase in engine efficiency was observed with the ITES in comparison to independent integration of ORC system, E-booster and mild hybridisation.

Summary:

ITES provides a lower cost, smaller package and higher efficiency approach to integration of waste heat recovery, low voltage electrification and supercharging.

TECHONOLGY Report

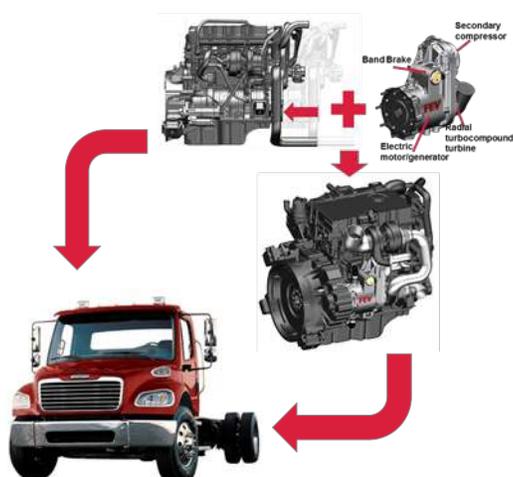
In MD application, 8% average BSFC reduction in steady-state engine operation. Up to 5% improvement over independent integration of technologies in steady operation. 12% and 13% BSFC reduction on World Harmonized Transient Cycle (WHTC) and Functional Threshold Power (FTP) cycle respectively. 8% and 10% BSFC reduction on off-highway tillage and front loader application cycles. 11% increase in fuel economy for a

class 6-7 vocational truck on ARB transient cycle.

In Heavy Duty (HD) application, 5% average BSFC reduction in steady state engine operation. Up to 1% improvement over independent integration of technologies in steady operation.

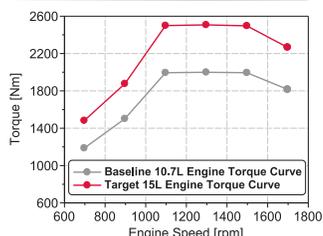
Nikhil Raghavan

ITES system applied on medium heavy duty engine installed in a class 6-7 vocational application



Parameter	Baseline Engine	Downsized Engine with ITES
Displacement [L]	7.7	5.1
No of Cylinder [-]	6	4
Bore [mm]	110	110
Stroke [mm]	135	135
Compression Ratio [-]	17.6	17.6
Peak Power [kW]	228@2200rpm	228@2200rpm
Power Density [kW/L]	29.6	44.7
Peak Torque [Nm]	1200	1200
Air System [-]	Turbocharged with HP EGR	Turbocharged with HP EGR and ITES unit (15kW M/G, 20kW Turbine, 5kW Compressor)
Water Pump [-]	Driven by Engine	Electrically Driven
Start-stop, Regen, Torque Assist [-]	No	Yes
Dimensions [mm]	1272x862x987	1045x864x984
Engine Weight [kg]	650	575

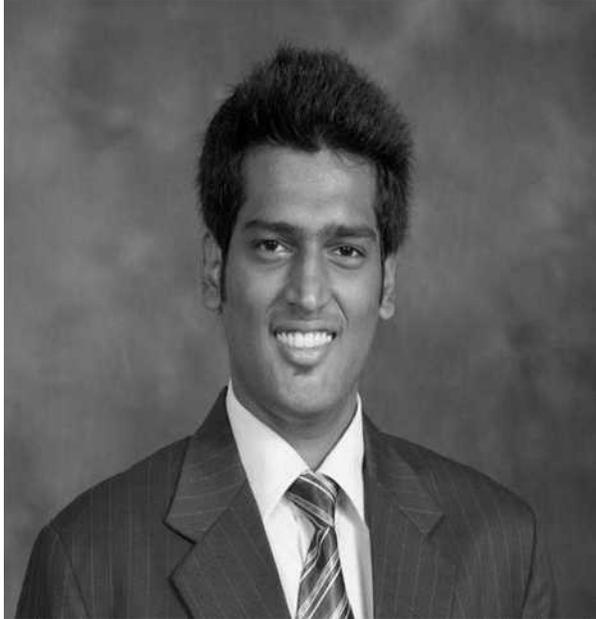
ITES system implemented on a HD engine with ORC turbine expander for class 8 tractor application



Parameter	Baseline Engine	Powerdense Engine with ITES
Displacement [L]	10.7	10.7
No of Cylinder [-]	6	6
Bore [mm]	125	125
Stroke [mm]	145	145
Compression Ratio [-]	17.6	17.6
Peak Power [kW]	322@1700rpm	403@1700rpm
Power Density [kW/L]	30.1	37.7
Peak Torque [Nm]	2000@1100rpm	2500@1100rpm
Air System [-]	Single Stage VGT with HP EGR	Single Stage VGT with HP EGR and ITES unit (15kW M/G, 5kW Compressor)
ORC System	No	Yes (Ethanol Based with 20kW Turbine Expander)

TECHNOLOGY

Report



Mobility Engineering interview with Satyum Joshi

Satyum Joshi studied Mechanical Engineering from Delhi College of Engineering (Now DTU) before moving to the US for his Master's degree in Mechanical Engineering at University of Michigan, Ann Arbor. He has been at FEV for the last 5 years and have worked on multiple engine and aftertreatment development programs for medium-heavy duty on-highway and off-highway applications.

How will fleet operators in India benefit from this technology?

The ITES technology is a very recent development and is in its nascent stage. In India, we will welcome partners who are fleet owners or manufacturers who would like to benefit from our technology. We expect the technology to provide up to 10% increase in vehicle fuel economy of medium and heavy-duty trucks. Furthermore, the ability of ITES system to provide torque assist will provide benefit during vehicle launch as well as hill climb. We expect that the ITES technology will be a boon to countries like India, Europe and China where stringent CO2 emission norms are in the process of being implemented in stages, whereas it is in an advanced stage in the US. The application of ITES system is highly dependent on the type of drive cycle the vehicle is subjected to. A lot of start /stop driving is essentially what will be favorable for the application

of the ITES system.

With the incorporation of ITES in the engine composition and configuration, will there be a change in the architecture of the overall vehicle?

Yes. There will be a dimensional change in the engine which will eventually reflect in the design of the vehicle itself. While, in the cabin there will be more space for the driver, the overall length of the vehicle can be reduced to offer better driveability of longer trucks and buses. There will be better visibility too.

For how long have you been working on the ITES technology?

The idea was developed by our team in 2017 and since then we have further developed the technology through extensive analysis for performance, durability, cost and complexity.

Which are the countries/manufacturers of vehicles where trials are being conducted?

There are no trials being conducted at the moment. We are close to development of prototype for testing. There is strong interest of the technology in China.

In your answer to my first question you mentioned that it would be a boon to India, Europe and China. These are vastly diverse topographies and nations. How do you evaluate the anticipated benefits in these three? Specific to India, what suggestions do you have?

Yes, however three items are common: Upcoming stringent CO2 regulations, strong push for electrification (from government as well as customers) and lot of start/stop drive cycles for MD and HD applications.

Once the ITES is finalised, do you suggest kits or transfer of technology or any other mode?

Yes, ITES will be provided as an add-on solution for MD and HD engines. Any manufacturer can partner with us and we can develop an ITES system specific to their application.

Nikhil Raghavan



TECHONOLGY Report

VOLVO'S ELECTRIC BUSES TO SERVE AS MOBILE LIBRARIES IN THE CITY OF GOTHENBURG

What is probably some of the world's first electric mobile libraries will enter into traffic in Gothenburg, Sweden, next summer. When Gothenburg City Library decided to invest in modern mobile libraries the choice was electric buses from Volvo.



SILENT, ELECTRIC BUSES WITH ZERO EXHAUST EMISSIONS ARE WELL SUITED TO FUNCTION AS MOBILE LIBRARIES.

Gothenburg City Library currently has two mobile libraries operating in and around the city, visiting about 70 mobile library stops and 110 preschools. Two new all-electric Volvo buses have now been purchased, scheduled to replace the existing mobile libraries in July 2020.

The new mobile libraries will appeal more clearly to children and families, with the focus on experiencing and reading. This will be clearly seen in the interior furnishings, which apart from bookshelves will accommodate meeting-places for children and adults

alike. Finnish company Kiitikori OY has been given the task of furnishing the bus interiors.

The Volvo 7900 Electric buses will be delivered as a complete turnkey solution, with Volvo handling all maintenance of the vehicles and their battery packs at a fixed monthly cost. Overnight parking, charging and maintenance will take place in the new Volvo Trucks centre in Mölndal. This concept allows Gothenburg City Library to have the vehicles in operation for far more hours than today's buses.

"The order is the result of a cooperation between Kiitikori OY, Volvo Truck CenterMölndal and Volvo Buses. Gothenburg City Library has followed the example of an increasing number of our customers, purchasing a comprehensive solution where we take care of the bus and all the surrounding services," says Jonas Pettersson, Sales Director South at Volvo Buses.

"We're looking forward to once again having mobile libraries in summer 2020, allowing us to visit all children - including those who live or attend preschool in the Gothenburg inner-city green zone. We chose electric buses to ensure this possibility throughout the vehicles' lifetime, which is no less than 12 years," says Anette Eliasson, sector manager in the Gothenburg Municipality Cultural Department.

The electric buses have a 250 kWh battery capacity, and are charged using a CCS cable. Volvo's electric buses have about 80% lower energy consumption than a corresponding Euro 6 diesel bus.

Volvo electric buses have been sold to cities in Sweden including Gothenburg, Kungälv, Malmö and Uddevalla. Overseas sales of Volvo's electric buses include cities in Denmark, Britain, Luxemburg, the Netherlands, Norway and Poland.



FEATURE

HARLEY-DAVIDSON ELECTRIFIES THE FUTURE OF TWO-WHEELS WITH LIVEWIRE MOTORCYCLE

H-D has continuously redefined the motorcycle industry during the last 116 years of its existence.



The all-new electric Harley-Davidson LiveWire made its European debut at the Milan press conference of the EICMA show in November last year. Their announcement reveals eagerly-awaited specification and details about LiveWire, which was unveiled in Milwaukee during the company's 115th Anniversary this past Labor Day weekend.

Due for release in 2019, LiveWire was first confirmed during the announcement of the company's "More Roads to Harley-Davidson." On July 30, 2018, Harley-Davidson shared plans to accelerate its strategy to build the next generation of riders globally. As part of this accelerated plan, Harley-Davidson intends to be the world leader in the electrification of motorcycles, and is aggressively, but wisely, investing in electric vehicle technology. Harley-Davidson is excited about the future of electric motorcycles and expects to deliver a full portfolio of electric motorcycles by 2022.

H-D has continuously redefined the motorcycle industry during the last 116 years of its existence and with

the announcement of LiveWire, it again pushes the envelope as the first electric production motorcycle, the announcement of which was a big event in a consumer electronics show in Las Vegas.

"We're at a historic juncture in the evolution of mobility, and Harley-Davidson is at the forefront," said Matt Levatich, Harley-Davidson's President and CEO. "Innovation that moves the body and soul has always been at the heart of our brand, and this next chapter in our history is about creating products and opportunities for existing and aspiring riders of all ages and walks of life."

Our vision for the future is all encompassing," said Levatich. "For all ages, from urban professional to exurban retiree, and from commute-minded to thrill-seeking, we are creating the products and opportunities for existing and aspiring riders to feel the transformative power of the two-wheeled riding experience. These two concepts are further statements towards that our commitment to lead in the electric mobility space that



FEATURE



begins this fall with the production 2020 LiveWire.”

Technology

The LiveWire motorcycle features a RESS (Rechargeable Energy Storage System, or the main battery) composed of lithium-ion cells surrounded by a finned, cast-aluminum housing. The LiveWire motorcycle is also equipped with a small 12-volt lithium-ion battery that powers the lights, controls, horn and instrument display. Charging can be completed using the on-board Level 1 charger that plugs into a standard household outlet with a power cord that stores below the motorcycle seat. LiveWire can also be charged with a Level 2 or Level 3, DC Fast Charge (DCFC), through a SAE J1772 connector, (USA), or CCS2 – IEC type 2 charging connector in international markets. All Harley-Davidson dealers who sell the LiveWire motorcycle will offer a public charging station with DCFC.

The vision behind the production LiveWire motorcycle began with Project LiveWire, revealed as a prototype in 2014 as an effort to gauge the potential of an electric-powered motorcycle as envisioned by Harley-Davidson. Drawing from the experiences of the Project LiveWire demo tour and following an intensive development program the Harley-Davidson LiveWire model offers the rider a new, high-performance motorcycling experience. Propelled by the immediate torque of an

all-electric motor, the LiveWire motorcycle is capable of astounding acceleration with just a twist of the throttle – no clutching or gear shifting required. A low center of gravity, rigid aluminum frame and premium adjustable suspension components give the LiveWire dynamic handling. Performance and range are optimized for the urban street-rider.

Owners will also be able to check how much juice is left in the battery and the exact GPS location of their internet-connected Harley via a smartphone app. The all-new Harley-Davidson LiveWire will be on sale next year, and further details regarding pricing and pre-order process will be released in January 2019.

Nikhil Raghavan



FEATURE

HM-T2X01 Cruiser - World's first self-recharging Motorcycle

An indigenous effort by a Coimbatore-based engineer creates waves.



The world as we know is shifting from the common IC engines to hybrid and all-electric vehicles. The constant issue faced by E-scooter customers is the range and the challenges faced in recharging their vehicles at work place or public places. The rising cost of fuel has also affected two-wheeler customers in recent times, with no foreseeable solution in the immediate future.

Coimbatore-based Jayandra Mehta, who gave up an initial interest in software engineering to do his mechanical engineering, conceived the idea to make an electric motorbike which would have a self-charging mechanism, to avoid the hassle of finding charging points.

Jayandra's lineage boasts of his mother being from the royal family of Kollengode and the daughter of

Ramavarma Thamban. His paternal grandfather was the chief engineer in ACC cement factory and a colleague of Mr. Soren Kristian Toubro, who later set up L&T.

For the purposes of this experiment a contemporary donor vehicle that was trendy and classy during its time was chosen - the T2 Cruiser. The T2 Cruiser is a home built electric cruise motorcycle capable of reaching a minimum range of 110 Km at 25 - 30Km speed range within a city.

There have been attempts to manufacture an electric cruiser motorcycles across the globe, the designs have ended up as café racers. These motorcycles were built for high speed and trendy looks. But the fact is that these motorcycles did not exceed 60Km range. The T2 Cruiser has been built with a low hung dragster



FEATURE

like appearance but with the range beyond that of an electric scooter. Currently the top speed of the motorcycle has been limited to 25 Km/h as per Indian EV laws of registration. But continuous progress is being done to exceed the 25 Km/h top speed limits and reach that of the Donner motorcycle (70 Km/h).

“Every EV customer knows that they cannot use their e-vehicles for an extended range as they will get stuck without facilities for recharge and the non-availability of infrastructure. Fear and lack of confidence on EV is our major current scenario. We at PHT have developed systems that cater to the day to day requirements of an ordinary customer. As the first step towards a green nation, the response to the range will be answered shortly,” says Jayandra.

The test was started with 53.6 volts for an initial feel of the vehicle in a circuit ride with a combination of junction, speed breakers, S Bends, straight stretch, sharp curves, pot holes and small slopes. In other words, the test is done to note any vibrations, smoke and voltage leak.

Gradient Test:

The second test was also with the same battery charged to 53.6 V to measure load carrying capacity on slopes. A weight 190Kg pay load plus 108Kg kerb weight was pulled on a slope of gradient 5 degrees and height of 15 feet. The pulling slowed down at 49.2 V with 298 Kg payload. Post weight reduction the pulling stopped at 47.7V with 70Kg payload.

Conclusion:

As with the brief on the HM-T2X01 Cruiser stated, it is proven that it is possible to convert a conventional vehicle into an electric vehicle with a range comfortable for a city or rural user. The self-recharging capability of the vehicle is the first of its kind in the world. “In the future as the battery technology improves the desired range, it is always a bonus having a self-charging capability on the vehicle to aid quick and cost-efficient means of battery recharge . We may also end up with a limitless range vehicle in the future,” says Jayandra.

Nikhil Raghavan

Product Specifications

- Weight - 120Kg
- Pay load Capacity- 300 Kg
- Output Voltage- 1.2KW (customizable)
- Motor Capacity- 250W-2000W
- Tyre Size- Front 4-ply rating 2.75 x 18; Rear 6-ply rating 120/80 x 16
- Battery- 48V 25A, 60V 30A
- Battery replacement - 5 years
- ECU Operated controls

Unique selling Proposition

- Eco friendly
- Zero Carbon emission
- Avoids frequent plug-in
- Typical motorcycle experience and ride quality
- Maintenance free
- No trips to the service station
- User friendly

Product developer: Jayandra H Mehta

Email: Jayandra.mehta@outlook.com

URL: www.phtpro.com



TWO-WHEELER MOBILITY: THE FUTURE IS ELECTRIC

With massive strides being made all over the world to move towards electrification of mobility, the two-wheeler segment in India, the largest market in the world, is witnessing innovative introductions in bikes and scooters from several niche players.

While government announcements, policies and guidelines for electric vehicles, are being made in fits and starts, there is a serious undertone in all these proclamations. That the future is surely going the electric way! This has prompted several existing and upcoming manufacturers and developers of vehicles to come up with plans and ideas, besides prototypes and production series. All this is being done with a clear view that anytime there will be a sure necessity to resort to electric vehicles, even as there doesn't seem to be any trend in the lowering of petrol and diesel prices.

Even before the government announced its policy on the electric vehicle introduction in India's immediate future mobility, there were several companies importing electric scooters for limited, localised sales. But now, things are getting hotter and there seems to be a lot of activity among manufacturers, service providers, battery producers, motor manufacturers, charging equipment suppliers and others to undertake research and development in the two-wheeler segment in India. Readers may already be up to date on what is happening with the Tesla electric automobile.

In recently held automobile shows in different parts of the country, several manufacturers have boldly displayed their in-house developed concept vehicles, to gauge the reactions and responses from the public. Mostly favourable, especially considering the rising cost of traditional fuel, these concepts are slowly creeping into regular production lines, albeit tentatively. The slight hesitation is due to the non-establishment of recharging infrastructure in public places. But, technical advancements are happening at a fast pace and in smaller vehicles, the facility to recharge the batteries overnight at home is the available option. For office goers, the facility to recharge at the workspot is an option. For larger commercial vehicles like intercity and intracity buses, the facility to recharge in their depots are what will be looked at. So will it be for short distance, regular service trucks of fixed routes operated

by logistics companies.

Elsewhere in this issue of Mobility Engineering, you can read about an indigenous effort from Coimbatore to develop a motorbike and also Harley-Davidson's futuristic LiveWire.

Here are some of the contenders in the two-wheeler electric mobility arena:

Ather Energy – Ather 450

Co-founded in 2013 by IIT graduates - Tarun Mehta and Swapnil Jain, Ather Energy is one of the few hardware automotive start-ups in India. The company has built India's first truly intelligent electric scooters and is backed by the founders of Flipkart, Tiger Global and Hero Motocorp.



ATHER EARLY DESIGN - 1



ATHER 450

FEATURE

Designed from scratch, the Ather 450 & Ather 340 are products made in India that have been customized to Indian conditions and riding sensibilities. Every little thing in and around the products have been crafted from an obsessive attention to detail to offer a seamless ownership experience.

The flagship Ather 450 comes with a top speed of 80 kmph, a range of up to 75 km and an acceleration of 0-40 kmph in 3.9sec and ensures a riding experience that's ideally suited for city commute. Both the Ather scooters are equipped with a touchscreen interactive dashboard and an integrated app which allows first in its category features like onboard navigation, remote diagnostics and over-the-air (OTA) updates for future improvements.

The Ather 450 is currently plying in Bengaluru with Chennai being next in line for expansion. Not following the typical dealership format, Ather Energy interacts with consumers at AtherSpace, their thoughtfully designed experience centre in Indiranagar, Bengaluru. Here, product specialists personally take interested customers through every detail of the vehicles and manage the test ride, while the purchases are made online, on the company website. Ather will also set up charging solutions for each consumer at their residence for overnight charging.

What completes the experience is AtherGrid, a comprehensive public charging network launched in May 2018. With 30 locations on board, Bengalureans will find this infrastructure within 4 km of reach. Designed keeping in mind the lifestyle of the owners, it's set up at places they would visit-tech parks, shopping malls, multiplexes, cafes and restaurants and allows them to charge up to 80% in an hour.

AtherGrid has been opened to all electric vehicles which can charge from a 5A/15A plug point. Ather Energy has filed 43 patent applications along with 11 international patent applications and 122 design registrations of their products that have been designed in India and are being manufactured at their Whitefield facility in Bengaluru.

Twenty Two Motors- Flow

Established in August 2016, Twenty Two Motors Pvt Ltd is a new age smart electric vehicle innovator. The company focuses on developing advanced connected electric vehicles and change the urban commutation

landscape by providing powerful smart vehicles to the technology savvy generation. The technology is enabled with artificial intelligence and the unique features include lithium ion storage, Internet of Things and advanced Electric Power Trains and the system has been dotted with state of art sensors and smart features.

The technology is seamlessly supported with real time connectivity to cloud. The integrated application provides a glimpse into system even from thousands of miles of distance. The innovator aims to make electric vehicles advanced, powerful and affordable for the next generation. The company believes in designs comprising of elegance and simplicity although ensuring maximum performance and safety while constantly infusing technology in automobiles.

Twenty Two Motors' "Flow" scooters are enabled with IOT technology and have 60 IOT sensors that provide essential data to the company to keep a track on the performance of the vehicle. The scooters have



PARVEEN KHARB AND VIJAY CHANDRAWAT, CO-FOUNDERS, TWENTY TWO MOTORS AND ALLEN KO, CHAIRMAN, KYMCO



TWENTY TWO MOTORS KYMCO

FEATURE

accelerometers and gyroscopes and also sensors that feed data via machine to machine chips to its cloud services. This data covers speed, acceleration, distance covered, condition of the battery and other critical components. Use of such technologies help in minimizing breakdown. It also has inbuilt geo fencing feature which allows security against theft as the vehicle alerts its owner if it goes beyond its geographical boundaries. With the partnership with KYMCO, Twenty Two Motors is coming up with ionex batteries which are waterproof, lightweight, and are easy to swap as well. The scooter employs a combined range of 160km, and these can be charged up to 70 per cent in an hour. Further enhancing the range is a fixed reserve battery that offers up to 20km range for emergency use. This brings the total range to 180km, which is ample for an electric scooter to commute in the city.

Parveen Kharb and Vijay Chandrawat, Co-founders, Twenty Two Motors form an incredible team of engineers which focuses on building differentiator technology as their core mission. Within a span of a year, the company has grown from a two-member founding team to more than 20 employees.

Emflux Motors – Emflux ONE

Emflux Motors is the brainchild of extremely passionate young people who were wanting to do awesome stuff for the future of the human race based on a shared vision - Electric Vehicles in this case - well, at least for a start. Emflux aims to build beautiful, desirable, and meaningful products and services with zero compromise on quality and the vision these products are based on, and the very first culmination of all of these factors has been willed into solid reality in the avatar of the EmfluxONE - a fully faired superbike that packs enough tech and mech to go neck to neck in performance with 700cc plus motorcycles. It's journey from vision, to concept, to prototype has been riddled with challenges at every turn, but the passionate Emflux team overcame every single one of them to successfully build their first prototype. It was a journey that spanned a little over 500 days, and countless sleepless nights. And finally, it's here for the world to see.

The Emflux team consists of 25 young engineers, designers, and others from various fields, most of them fresh out of college, and it was founded at the core by the confluence of a common vision shared by three guys



Emflux ONE



from very different backgrounds - Varun Mittal, Ankit Khatri, and Vinay Raj Somashekar.

It all starts with the design. The first contact that the world has with any product is the way it looks to your eyes, followed by the way it feels in your hands. The Emflux ONE was designed to have the proportions and aggression of a superbike coupled with the calm and quiet of an electric vehicle. The idea was to have big, clean, and beautifully flowing surfaces guided by sharp purposeful lines, combined with a confident stance, strong proportions, and a sculpted overall volume. Electric technology is clean and beautiful – and the design must be an embodiment of that emotion. All the design panels were meticulously hand-crafted with fiberglass. But design is not only about the external parts, and it is not only about looking good – it's also about what goes inside and how it works. In this regard, the design team worked in tandem with the Mechanical Engineers to create a product that functions as beautifully as it looks. Barring the brakes, tyres and the suspension, every single component on the motorcycle has been designed and engineered in-house.



FEATURE



Emflux ONE CHARGING

The electric drivetrain components available in the market were nowhere near as powerful or inter-compatible as the ones that would be needed to run this motorcycle, so the engineers at Emflux decided to develop all the components in-house. It was important that all the electronic components work together as one cohesive unit. The drivetrain includes the battery pack, the BMS, an on-board charger, the motor controller, and the motor which is run by a powerful master controller capable of running powerful neural networks.

Everything is controlled digitally to improve performance and convenience via over-the-air SW updates. These are some of the most power-dense circuits in the industry.

For example, the motor controller which weighs only 2 kilos including the casing and heat sink can still deliver 60 kW of power. The charging stations christened WARP Charger will be installed on highways and other strategic points once the law allowing resale of electricity is changed.

Emflux aims to help other companies develop their EV solutions by leveraging the patentable technologies

they developed for Emflux ONE. They can develop the electric drivetrain including the battery, BMS, charger, motor controller and the motor for 2 as well as 4 wheelers. Emflux will generate revenue by selling premium performance bikes and also by licensing their technology to OEM companies as well as developing customized solutions for others. Emflux plans to produce just 199 units of the Emflux ONE for the Indian market and another 300 for the export. The standard version of the Emflux ONE is priced at ₹ 6 Lakh (\$USD 9350) on road and with the three performance upgrades of Ohlins suspension, forged alloy wheels and ultralight carbon fiber panels, the price will be ₹ 11Lakh (\$USD 17150) on road.

Ampere Electric – Reo / V48 / Magnus

Greaves Cotton Limited is a diversified engineering company and a leading manufacturer of Cleantech Powertrain Solutions (CNG, Petrol and Diesel Engines), Generator sets, Farm equipment, E-Mobility, Aftermarket spares and services.

Greaves Cotton recently acquired Ampere Electric Vehicles to strengthen its position in the last mile



FEATURE

affordable personal Mobility segment. This acquisition will give access of electric mobility solutions to millions of individuals at the bottom of the pyramid, accelerating the development of clean energy technology solutions for mobility needs of passengers and small businesses in India.

Ampere's products include electric vehicles in the personal and commercial mobility segment. Powered by lead Acid/Li-Ion Batteries, Ampere's product models – Reo, V48 and Magnus have been well received by different types of consumers – College Students, Housewives, Office-goers, Young Executives, Senior Citizens, Traders, Businessmen, Delivery partners and Logistics Providers etc.

These stylish Ampere electric scooters have low TCO and provide emission-free transportation. These vehicles are superior solutions for commuters who otherwise walk long distances or take public transport for their daily needs and boon to various E-commerce players who seek affordable and agile solution for their quick delivery in otherwise congested locales.

SUN Mobility – Energy infrastructure

SUN Mobility is a 50:50 joint venture between Virya Mobility 5.0 and Sun New Energy Systems, pioneers in electric mobility and clean energy. It is co-founded by Chetan Maini, founder of India's first electric car, Reva (Now Mahindra Reva) and Uday Khemka, Vice Chairman of SUN Group, two of India's well-established leaders in the new energy economy. The company was launched in April 2017 as a global leader providing energy infrastructure and services to the urban mobility sector.

They got 2018 off to a great start by unveiling the Circuit S bus in partnership with Ashok Leyland at the Auto Expo. It is India's first swappable battery bus which is designed for Indian conditions with seating capacity ranging from 25-35 passengers. With their technology of separating the battery from an electric bus, they were able to drastically bring down the upfront cost of the bus on par with a traditional diesel bus. Fully charged batteries can power the bus for 50-60 km and take under 4 minutes for swapping.

Their next milestone was achieved in April as they launched the world's first Interoperable Smart Mobility solutions for two and three wheeled electric vehicles. Launched in Bangalore and aimed at reinforcing the





electric mobility adoption in the country, their solution comprised of three key aspects:

Modular Smart Batteries - intelligent enough to customise themselves to each vehicle type and versatile enough to be used in combinations of one or multiple batteries to meet customers' different performance and range expectations.

Quick Interchange Stations - can be easily installed across a city, enabling customers to swap batteries quickly and conveniently in less than one minute, addressing any concerns around refuelling time.

Smart Network - connects modular Smart Batteries and Quick Interchange Stations, optimises battery performance and allows customers to locate stations and make payments via an app.

Microsoft partnership

Taking forward their commitment to boost the electric mobility ecosystem, they partnered with Microsoft to

build a Smart Network for their EV energy infrastructure. As part of the partnership, they will use Microsoft's IoT technology to connect the 'smart battery' and the Quick Interchange Stations (QIS).

As India prepares to step into the next decade by the end of this year, the drive to develop and produce Electric Vehicles in all types of wheeled mobility systems - 2, 3, 4, 6 and beyond, is gaining full momentum. Very soon, the dependence on petrol and diesel will minimise and, besides batteries, many other sources of power generation - solar, thermal, wind - will find place in the daily scheme of things. Already a spate of scooters is in the fray. Very soon, the bike segment will follow suit and simultaneously, the 3-wheeled commercial range of people and cargo carriers will adopt EV technology. Thereafter, the sky is the limit, as they say!

Nikhil Raghavan

TECHNOLOGY

Report

DIGITIZING THE FARMING SECTOR

Agriculture apps are very useful for Indian farmers and agriculture community which keep upto date with the latest technology of agriculture.



pump set, shade net, poly house, pack house, hi-tech nursery, small nursery, new tissue culture lab, low-cost onion storage and mushroom cultivation.

Information on availability of seeds and fertilizers in various government, cooperative and private outlets nearby. A section gives

weather forecast for next 4 days.

The digital revolution is gradually filtering down to our rural countryside where the bulk of our agriculturists and farmers dwell. With the deep penetration of satellite television, mobile telephony, Internet and other modes of digital revolution, the dividing line between our rural landscape and urban life are quickly merging.

In recent times there is a slow but steady migration of corporate professionals and the educated next generation from agricultural families, moving back to their farmlands to develop farming in a more organic way. These are the more advanced farmers who depend a lot on information, which only digitization can provide.

Early last year, the Government of Tamil Nadu launched Uzhavan, an App for the farmers in the state. The App provides complete information on a real-time basis, related to agriculture and additionally, provides nine important services such as weather updates and latest crop rates. Supported by Tamil and English languages the Uzhavan App is available on Android and can be downloaded from the Google Play Store.

Services on Uzhavan App

The specialized App for the farmers and agriculturists provides information on farm subsidies and details about crop insurance and services. Farmers can even book farm equipment from vendors.

There is abundant information on schemes such as seeds, anti-bird net, plastic mulching, beehives, machinery, pre-cooling chamber, reefer van, mobile vendor cart, solar

Farmer-2-Farmer

Riding piggyback on this wonderful Uzhavan App initiative, TAFE – Tractors and Farm Equipment designed a special service called JFarm Services and offered the same on the App. The focus of JFarm is on tractors and farm equipment. TAFE informs, “The unique Farmer-2-Farmer feature allows farmers to rent their existing tractors and farm equipment to other farmers seeking to hire them.”

JFarm Services is an initiative to increase easy access to farm mechanization solutions through rental of tractors and farm equipment for small and large farms, localized weather forecast, latest mandi prices, agri-news alerts and advisory. Small and marginal farmers, who hold more than 80% of the land holdings in India may not be able to afford ownership of tractors or implements. JFarm Services bridges this gap by connecting these farmers with tractor and equipment owners through its Farmer-2-Farmer platform.

This free app connects tractor owners and Custom Hiring Centres (CHCs) operated by tractors and equipment owners directly to farmers seeking farm mechanization solutions, thereby facilitating a fair and transparent rental process while focusing on quality, dependability and timely delivery. JFarm Services offers the farmers and renters a wide range of prospects for hiring and renting of farm equipment and connects them directly to negotiate and fulfil their respective requirement.

With the creation of this platform comprising farm machinery owners and users, JFarm Services has impacted the

TECHONOLGY Report

lives of over 65,000 farmers across 8 states in India since its inception in 2017.

Currently, JFarm Services (JFS) operates in Rajasthan, Gujarat, Madhya Pradesh (MP), Uttar Pradesh (UP), Bihar, Odisha, Jharkhand and Telangana – making farm mechanization viable and affordable to all. JFarm Services is further fostering digital empowerment of Indian farmers while creating a breed of new rural entrepreneurs, significant job opportunities and employment.

TRRINGO

Similarly, TRRINGO is a foremost tractor and farm equipment rental business that aims to raise the level of mechanization in Indian farming through the power of technology and a strong franchisee network to make farm mechanization easily accessible, affordable and reachable to farmers across India. Since its inception in 2016, TRRINGO has influenced the lives of over 1 lakh farmers.

A Mahindra & Mahindra venture, TRRINGO draws on the vast experience and understanding of rural India that the group has acquired over the decades to create a business that is aimed at raising the quality of lives of Indian farmers and people associated in the farming sector.

Atindriya Bose, CEO - Trringo, says, “We began last year by clocking more than 1 lakh hours of farm mechanization. This marks a significant milestone in our journey of increasing farm productivity and driving rural prosperity. Since its inception, TRRINGO has played a three-fold role by making farm mechanization accessible for all farmers, generating employment for tractor operators and creating business opportunities for the rural businessman.”

Mr. Bose further added, “At TRRINGO we want to improve productivity and reduce cost for the farmer by consistently delivering on our customer value proposition of empowering farmers with advanced farm equipment. All these will play a pivotal role in heralding a new age of agriculture, one that we define as Farming 3.0. Going ahead, we will further expand our base and focus on adding significant

value to more farmers.”

Some of the best farmer/agriculture Apps:

These agriculture apps are very useful for Indian farmers and agriculture community which keep upto date with the latest technology of agriculture. These apps provide help to Indian farmers and fill the information gap between the rural people and Govt with rural development. These are Android apps for Indian farmers used for agriculture which provides the latest market rates, weather forecasting, Govt policies and schemes for farmers, latest technology videos, news related to agriculture etc. Farmers can directly ask the question and query to the Agriculture experts using these apps to solve their query instantly also they can watch their videos related to new technology, successful farmers, machinery etc.

Agri App is one of the most liked apps by farmers. It is an online farming marketplace bringing Kisan, farming input/output, government service on an online platform.

IffcoKisan provides information about the latest agriculture advice, latest mandi prices, and various farming tips. It also provides weather forecast information. It also provides agriculture alerts to farmers in 10 Indian languages.

Agri Media Video App is one of the most popular in mobile apps for farmers in the video category. It is an online marketplace bringing farmers, agriculture input/output, farming retail and fulfilment service on an online platform.

FarmBee-RML Farmer is available in 10 different Indian languages. It provides fertile agriculture content and information at every stage of the crop life cycle. A farmer can choose from 450 crop varieties, 1300 markets, 3500 weather locations.

Kisan Yojana is another popular Android agriculture apps available for free. It provides information about all Govt schemes to Kisan. This mobile application also saves the time and travel expense of Kisan to reach the state Govt office is saved.

The digital revolution in the agricultural and farming sector is truly on and with it, the mobility is getting a fillip. It won't be long before electric tractors and allied farm equipment move in to complete the revolution. Solar energy is already there!



Nikhil Raghavan

TECHNOLOGY

Update

BOEING AUTONOMOUS PASSENGER AIR VEHICLE COMPLETES FIRST FLIGHT

Boeing is the world's largest aerospace company and leading manufacturer of commercial jetliners and defense, space and security systems.



Boeing NeXt, which leads the company's urban air mobility efforts, recently completed their first test flight of its autonomous passenger air vehicle (PAV) prototype in Manassas, Virginia. Boeing utilised their subsidiary Aurora Flight Sciences to design and develop the electric vertical take-off and landing (eVTOL) aircraft and will continue testing to advance the safety and reliability of on-demand autonomous air transportation. The eVTOL has a design range of up to 50 miles.

The PAV prototype completed a controlled take off, hover and landing during the flight, which tested the vehicle's autonomous functions and ground control systems. Future flights will test forward, wing-borne flight, as well as the transition phase between vertical and forward-flight modes. This transition phase is typically the most significant engineering challenge for any high-speed VTOL aircraft.

"In one year, we have progressed from a conceptual design to a flying prototype," said Boeing Chief Technology Officer Greg Hyslop. "Boeing's expertise and innovation have been critical in developing aviation as the world's safest and most efficient form of transportation, and we will continue to lead with a safe, innovative and responsible approach to new mobility solutions."

Powered by an electric propulsion system, the PAV proto-

type is designed for fully autonomous flight from take-off to landing, with a range of up to 50 miles (80.47 kilometers). Measuring 30 feet (9.14 meters) long and 28 feet (8.53 meters) wide, its advanced airframe integrates the propulsion and wing systems to achieve efficient hover and forward flight.

"This is what revolution looks like, and it's because of autonomy," said John Langford, President and Chief Executive Officer of Aurora Flight Sciences. "Certifiable autonomy is going to make quiet, clean and safe urban air mobility possible."

The test flight represents the latest milestone for Boeing NeXt. The division works with regulatory agencies and industry partners to lead the responsible introduction of a new mobility ecosystem and ensure a future where autonomous and piloted air vehicles safely coexist. In addition to the PAV, the Boeing NeXt portfolio includes an unmanned fully electric cargo air vehicle (CAV) designed to transport up to 500 pounds (226.80 kilograms) and other urban, regional and global mobility platforms. The CAV completed its first indoor flight last year and will transition to outdoor flight testing in 2019.

"Boeing was there when the aviation industry was born and in our second century, we will unlock the potential of the urban air mobility market," said Steve Nordlund, Vice President and General Manager of Boeing NeXt. "From building air vehicles to airspace integration, we will usher in a future of safe, low-stress mobility in cities and regions around the world."

Boeing is the world's largest aerospace company and leading manufacturer of commercial jetliners and defense, space and security systems. A top U.S. exporter, the company supports airlines and U.S. and allied government customers in more than 150 countries. Boeing products and tailored services include commercial and military aircraft, satellites, weapons, electronic and defense systems, launch systems, advanced information and communication systems, and performance-based logistics and training.

CES 2019 SET THE WORLD ABUZZ WITH INNOVATIVE TECHNOLOGIES

CES 2019, from January 7 to 11 in Las Vegas, USA, demonstrated the bright future made possible by the next generation of technology innovation that fuel the expansion of technology into new areas such as vehicle tech, 5G, artificial intelligence, smart cities, resilience, sports, digital health and more.



UNVEILED SIGNAGE

At CES 2019, owned and produced by the Consumer Technology Association (CTA), more than 4,500 exhibitors showcased the latest tech innovations to some 180,000 attendees across more than 2.9 million net sqft of exhibit space. From global brands to visionary startups, these companies set the world abuzz with the promise of technology.

“CES showcased the power of innovation to solve global problems and improve lives around the world,” said Gary Shapiro, President and CEO, CTA. “The passion, ideas and business connections at CES made this the most significant global tech event – and the most inspirational week of the year.” “Every business must now embrace technology to succeed,” said Karen Chupka, Executive Vice President, CES. “And companies like Proctor & Gamble, John Deere and Raytheon proved that at CES 2019.”

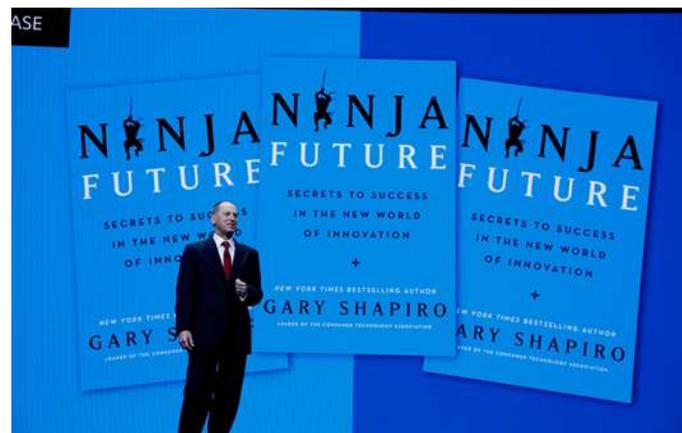
The CES 2019 keynote stage featured some of the biggest names in technology, including AMD, AT&T Communications, IBM, LG and Verizon. CTA released its 2019 International Innovation Scorecard grading countries on how well they support innovation and announced it will invest \$10 million in venture firms and funds focused on

women, people of colour and other underrepresented startups and entrepreneurs. CTA also released its newest book, *Ninja Future*, exploring the skills needed to remain competitive in the rapidly-changing future.

CES was the only show where the entire 5G ecosystem – the backbone for transportation, virtual reality, sports technology and digital health – came together. “5G will change everything and it is the promise of so much more than what we have seen from wireless technology,” Hans Vestberg, CEO, Verizon, said during his keynote. Fellow keynoter John Donovan, CEO of AT&T Communications, discussed the company’s recent launch of its 5G Evolution network.

CES 2019 was also a turbo-charged mobility show, with 11 of the world’s leading car manufacturers highlighting the future of transportation – including an air taxi from Bell Helicopter and an electric motorcycle from Harley-Davidson. Self-driving technology will save lives, enable greater accessibility and improve productivity.

The event showcased that artificial intelligence will influence every aspect of human life. IBM Chairman, President and CEO Ginni Rometty’s opening keynote explored how AI will prove that data is the “world’s greatest natural resource,” enabling revolutions from smart cities to health



CES 2019

Report

care, transportation to robotics. During Rometty's keynote, Delta CEO, Ed Bastian and Walmart EVP of Food, Charles Redfield shared examples of AI and blockchain technology in their businesses.

The CES Sports Zone showcased the entire sports tech ecosystem – innovations in smart venues, training, virtual and augmented reality and eSports creating immersive content that will change the way people play, watch and experience sports. Twitter CEO Jack Dorsey and NBA Commissioner Adam Silver discussed how their partnership proves social media can promote fan engagement, and the Gamespot eSports truck featured 10 gaming kiosks for both professional gamers and attendees to showcase their skills.

CES brought together content creators, Hollywood, the advertising industry, media and leading CMOs – such as Proctor & Gamble's Marc Pritchard, IBM's Michelle Peluso, Unilever's Keith Weed – to explore the future of brand marketing and entertainment. Exhibits and conference sessions explored the effect of AI on marketing and consumer engagement, mobile and over-the-top video, and content consumption.

Eureka Park, the home for startups at CES, featured more than 1,200 companies from over 50 countries offering disruptive innovations, attracting investors and big-name brands. This year Eureka Park – which has launched successful companies including Ring, Benjilock and LifeFuels – included a pitch competition, sponsored by the

Consumer Technology Association Foundation and AARP.

Digital health technologies were a major theme, and attendees experienced the latest advances and trends in health care. Over 260 doctors and other health professionals attended the Disruptive Innovations in Health Care conference, which offered Continuing Medical Education (CME) credits at CES for the first time.

Resilient technologies will keep the world healthy, safe, warm, powered, fed and secure. Sustainable technologies from companies including YOLK and Zero Mass Water will produce efficient energy solutions and help provide drinking water to developing nations, while reducing the global carbon footprint. Others like Higher Ground Technologies keep us connected anywhere in the world.

In addition to the CES Corporate Keynotes, the CES 2019 conference programme featured industry leaders and visionaries on more than 250 sessions focused on disruptive industry trends that will shape the future of consumer technology.

During the session, "AI Use Cases: Health, Mobility and Cyber security," executives from USAA, Philips and Veoneer detailed opportunities with AI as the technology advances. The panel also identified several challenges in its use to solve pressing problems in health care, mobility and cyber security. The need for high quality and clean data emerged as an important priority to support the growth and evolution of AI in solving problems.

Continental

At CES 2019, Continental exhibited how a driverless vehicle could be used to stage and deploy delivery robots, taking packages all the way to the consumer – even when they're not able to physically receive them.

The seamless integration of a driverless vehicle – in this case, the Continental Urban Mobility Experience (CUBE) – and a delivery robot present a more effective and efficient distribution of goods. Driverless vehicles like the CUBE, Continental's autonomous electrified development platform, are generally considered as a solution for urban "first or last mile" mobility. This type of vehicle – often referred to as a robo-taxi or pod – will be a part of the seamless mobility value



CONTINENTAL CASCADED DELIVERY



CES 2019 Report

chain. The purpose of these vehicles will be extended to goods delivery to further utilise the available transport capacity and reduce idle times.

“With the help of robot delivery, Continental’s vision for seamless mobility can extend right to your doorstep. Our vision of cascaded robot delivery leverages a driverless vehicle to carry delivery robots, creating an efficient transport team,” Ralph Lauxmann, Head of Systems & Technology, Chassis & Safety division, Continental, said.

Automated goods delivery is forecasted to provide an answer for up to 80% of all business-to-consumer deliveries, according to multiple research sources. Continental views automated goods delivery as an integral part of future urban mobility as an addition to conventional goods delivery. Driverless vehicles like the CUBE can carry one or multiple delivery robots and deploy them to handle the last yards of the goods and parcel delivery logistics chain. “Industrialising the automation of goods delivery requires reliable, robust, high-performing and best-cost technology – a mix perfectly reflected in the automotive equivalent of automation. It is this very profile of expertise that has made Continental one of the industry-leading suppliers of advanced driver assistance systems and vehicle automation,” Lauxmann said.

With existing delivery robots serving as a development platform, Continental is ready to transfer and scale automotive technology to meet robot manufacturers’ requirements. “The challenges to a delivery robot parallel what we already solve for in automated vehicles,” said Jeremy McClain, Director of Systems and Technology, Continental North America. “Plus, delivery robots will require technology that is just as advanced and robust as our automotive solutions.” With the ever-increasing popularity of online shopping and the growth of megacities, unique solutions for package delivery will be needed. Driverless vehicles combined with delivery robots could be the perfect answer.

Driverless vehicles will represent a very important element in the Smart Cities of the future. They are considered by many experts as a key element of future mobility concepts to solve the challenges

of urbanisation. A driverless vehicle can be in use almost 24/7. Innovative city planners see driverless vehicles as a valuable addition to public mass transport by eliminating the need for a privately-owned car to get to the nearest point of access to other means of transport.

“There will be peaks in demand for driverless vehicles during the day. To make use of driverless vehicles outside those peak ‘rush’ hours is where robot-delivery comes in. “We see great potential in our automotive technology to support robotics companies in developing autonomous delivery robots as an additional use case for driverless vehicles” McClain said.

Schaeffler

Bio-Hybrid GmbH, a company belonging to the Schaeffler Group, presented at CES 2019 the near-production Bio-Hybrid – a new, modern form of personal urban mobility and means of transportation. The variable and electrically-assisted vehicles were showcased in the Cargo and Passenger versions.

“As a pioneer, Schaeffler presented the ‘Bio-Hybrid’ product category as a vision for private transportation in urban areas in 2016. This vision is now turning into reality. At the end of 2017, we established Schaeffler Bio-Hybrid GmbH. As a spin-off, the fully owned subsidiary is able to operate with the flexibility of a startup and has the mission to develop the Bio-Hybrid to production level. The world premiere of the two near-production prototypes at CES marked the



SCHAEFFLER BIO-HYBRID PASSENGER 2019



CES 2019

Report

next step on the road to the planned market launch in 2020,” Prof. Peter Gutzmer, Deputy CEO and Chief Technology Officer of Schaeffler AG, said.

“A central aim is to prevent the impending total gridlock in big cities and to make them more pedestrian-focused and livable. This can only be achieved by de-conflicting traffic by means of new, intelligent vehicle concepts. An approach like this requires vehicles that in a connected and systemically shared environment attain high flexibility while minimising the need for space. This is exactly what the Bio-Hybrid offers,” Gerald Vollnhals, Project Manager at Schaeffler Bio-Hybrid GmbH, said.

Based on the concept unveiled in 2016, the Schaeffler startup continuously pursued the further development of the Bio-Hybrid. The versions showcased at CES will be deployed in a test field in the middle of 2019. In addition to the drive system, for example, the operating concept and the design were completely revised for this purpose. Concurrently, Schaeffler established a ten-member team the size of which is to double in 2019.

Patrick Seidel, who is responsible for strategy and business development at Schaeffler Bio-Hybrid GmbH, said: “In the next major step, we will continue to drive our marketing, sales and industrialisation concept and are open to partnerships in this respect.”

The Cargo and Passenger versions share the same modular platform delivering high levels of comfort and maximum safety standards. Due to its 4 wheels, the concept offers exceptional driving stability. As a result of having a roof and a windshield, the vehicle can be used in any type of weather and thus in all seasons. It is hardly wider than a normal bicycle and can be operated on bicycle paths as well with zero emissions.

The passenger version offers a new form of personal and design-oriented urban mobility. It comfortably seats two people behind one another. The cargo version provides a variable solution for zero-emissions hauling of goods. The vehicle to be showcased in Las Vegas is a kind of “pick-up.” The modular body makes the Bio-Hybrid a veritable quick-change artist: refrigeration vehicle, coffee shop or locked stowage compartment – anything is possible. In terms of cargo

volume and payload, the Cargo version is perfectly prepared to handle hauling requirements in urban areas and provides an alternative within the future mobility mix.

Hero Electronix

Hero Electronix has announced its entry into the consumer technology space with a series of AI-powered, connected devices. The team at Hero Electronix believes that a massive revolution is coming as smart devices proliferate driven by technology trends like ubiquitous connectivity, cloud computing, artificial intelligence and low-cost sensors. Existing products ranging from cameras to audio speakers are getting smarter and a whole new range of devices emerging (i.e. dash cam, child trackers) that can make our lives more convenient, safer and entertaining.

Taking advantage of these technologies, Hero Electronix plans to launch more than 10 intelligent products across Home Automaton, Automotive, Health and Entertainment domains in the next 5 years. Each of these devices is being architected ground up to solve specific needs of Indian consumers and to work in Indian environments and family set-ups. To develop these solutions, HEPL has made massive R&D investments over the course of past 24 months and partnered with global technology giants like Amazon and Qualcomm.

The first of these products was previewed at the CES 2019. This is a breakthrough product designed to be the centerpiece of security, entertainment and automation needs of your home. At its heart, it's a HD camera with advanced artificial intelligence that allows you to remotely monitor and protect your home. Features like facial recognition and 2-way audio help you to stay connected with loved ones. Night vision and motion (unknown person detection) alerts help guard against potential incidents. It has Alexa and home hub built-in, so you can use your voice to play music, control smart home devices, access skills and more- hands free. Moreover, this product is powered by the Qualcomm Vision Intelligence 100 Platform, based on the APQ8053 System-On-Chip (SoC). The Qualcomm Vision Intelligence platform includes a highly optimised custom CPU and GPU that



CES 2019 Report

is designed to provide high compute capability at low-power for on-device machine learning including integrated connectivity and support for display and audio features. Finally, it has a high-quality speaker that can fill your home with high fidelity sound.

This made-in-India device is among the very few innovations from India to be presented at CES 2019, which speaks to its capabilities and uniqueness. Planning for the long-term, Hero Electronix has invested in building the core technology components in-house. The complete technology stack - hardware, cloud software, device software, app - has been architected by its Engineers over a period of 2 years and built in collaboration with leading global partners. Additionally, Hero Electronix has made significant investments in AI (specifically image processing), which have led to significant breakthroughs in terms of product feature/functionality.

Ujjwal Munjal, Founder Director, Hero Electronix said, "We at Hero Electronix feel proud to have our products showcased at CES 2019, we intend on launching a series of AI-Powered connected products that are designed and built grounds up in India for India and the world. Each of these intelligent consumer devices is unique, innovative and first of its kind in many aspects, best in class even on a global stage."

Nikhil Rajpal, CEO, Hero Electronix said, "We believe we have a unique opportunity available to us at this point. There is a major revolution coming where AI powered connected devices can solve massive real-world problems. While we are addressing the home automation space with our first range of products in the near term, we will soon come out with products targeted at the automotive, health and fitness space."

ZF

CES 2019 saw an array of production-ready ZF technologies that will help to make fully autonomous driving in public traffic a reality. The company made the world premiere of ZF ProAI RoboThink, the most powerful AI-capable supercomputer in the mobility industry. This automotive-grade system, combined with ZF's fully developed sensor suite, allows real-time analysis of and reaction to virtually any kind



ZF PROAI ROBOTHINK

of complex traffic situations, making autonomous mobility-as-a-service possible. Fully networked system solutions based on the ZF Cloud link the vehicle to the IoT, as well as to customer applications such as payment systems or ride-hailing services. This comprehensive offering was on display at CES 2019 in the form of a fully operational robo-taxi, highlighting what is now feasible thanks to ZF.

"With its unique concept in terms of flexibility, modularity and scalability, this outstanding product accelerates the development of driverless vehicles as well as their ability to autonomously move people and goods," Wolf-Henning Scheider, CEO of ZF Friedrichshafen AG, said.

A performance of up to 600 trillion calculation operations per second (600 teraOPS) puts the ZF ProAI RoboThink in the pole position for automotive-grade central control units. This level of computing power is designed to be capable of networking the stream of internal and external sensor data with car-to-X communication and cloud-based data input in real time, providing a platform to help safely operate a Level4+ autonomous vehicle in virtually any kind of public traffic.

This is a precondition to support the future segment of autonomous ride-hailing services from areas with predefined routes like campuses or company grounds to the significantly more complex environment of public road traffic. In the wake of this developing trend, ZF also premiered its own software stack for new mobility concepts at the CES. This stack together with the latest ZF Pro AI and the company's



CES 2019

Report

comprehensive sensor set represent a fully integrated system for driverless vehicles that can be easily adopted by the new players in the field of mobility services.

Visteon

Visteon Corporation, a leading global supplier of automotive cockpit solutions, offered a glimpse into the smart, learning digital cockpit of the future at CES 2019. Visteon showcased advanced technologies that can power the in-vehicle user experience of the automotive cockpit in the emerging era of more automated driving.

Visteon's integrated solutions are aimed at improving safety on the road while enabling seamless access to information – from personal devices, the vehicle and the cloud – using the latest innovations in technology.

Key highlights of this new cockpit electronics architecture include: A high-powered cockpit domain controller that integrates the instrument cluster; infotainment and other cockpit functions into a single ECU with advanced graphics, over-the-air software updates, and state-of-the-art cyber security; large high-resolution displays that are curved and non-rectangular to deliver an enhanced viewing experience without limiting interior panel design; a scalable autonomous domain controller for Level 2 and higher automated driving that is integrated with the cockpit domain controller for seamless interaction with the driver; a machine learning-based voice recognition and text-to-speech solution for a natural language; conversational smart assistant In-cabin driver and other occupant detection and identification technology, also based on machine learning for

improved safety functionality.

“The shift toward electric cars and improved automated driving technology is an opportunity to rethink the cockpit in terms of how drivers and passengers interact with the vehicle and their surroundings. As vehicles become more automated, there is a need for fresh approaches to the human-machine interface in the cockpit – to ensure control can shift safely and seamlessly between the driver and the vehicle, and to keep occupants informed, engaged and entertained. “In the era of increased automated driving, the cockpit will become a smart, learning, mobile assistant,” Visteon President and CEO SachinLawande, said.

Visteon's industry-leading digital cockpit solutions offer automakers a complete suite of technologies to upgrade the user experience of their vehicles. At CES, Visteon demonstrated the integration between the SmartCore cockpit domain controller and the DriveCore autonomous driving controller, which combine to create a seamless HMI between the driver and the vehicle. This interface manages the experience of drivers and passengers as the vehicle seamlessly takes control from the driver or gives it back.

Bosch

At CES 2019, Bosch presented its connected mobility of the future. With the concept shuttle vehicle it developed in-house, Bosch is celebrating a world first at CES. In this vehicle, the company is presenting solutions for the automation, connectivity, and electrification of vehicles, and is giving visitors the chance to experience at first hand a new kind of mobility: driverless shuttles, which will soon be a feature on the streets of the world's cities.

“This will pay into our vision of mobility that is as emissions-free, accident-free, and stress-free as possible,” says Dr Markus Heyn, Board of management member, Bosch. For shuttle-based mobility such as this, Bosch will be supplying not only components and systems, but also a complete range of mobility services, such as reservation, sharing, and connectivity platforms, as well as parking and recharging services. Bosch believes that such connected services are essential for the shuttle-based mobility of the future.



VISTEON SMARTCORE HIGH



CES 2019

Report

The forecast market volume for these services is also high: while it was 47 billion euros in 2017, it is estimated that it will be as much as 140 billion euros by 2022 (source: PwC). Bosch also wants to have a share in this and aims for significant double-digit growth with the solutions it offers. For Heyn, there is no doubt: “In the future, every vehicle on the road will make use of Bosch digital services. We will consolidate them into a smart, seamlessly connected ecosystem.”

Faurecia

Faurecia, which has been developing a comprehensive technology offer to enhance people’s mobility experiences, addresses two key domains: Cockpit of the Future for a safer, more comfortable and personalised experience, and Sustainable Mobility for cleaner and more environmentally-responsible transportation.

Faurecia showcased how the onboard intelligence and integrated design of the Cockpit of the Future provides a more versatile, connected and predictive environment that allows people to make the most of their time onboard. Faurecia also demonstrated key technologies to accelerate the development of fuel-cell powered vehicles, a promising future zero-emissions mobility solution.

Connected and increasingly autonomous vehicles will become more complex, with a wide array of hardware, software and services to connect and control. Faurecia’s Cockpit Intelligence Platform (CIP), developed in partnership with Accenture, is

an electronics system that manages all the interior functions of the Cockpit for an intuitive interaction between occupants and the vehicle.

Using artificial intelligence, over time the CIP learns from information collected from cameras and sensors to predict and personalise the onboard experience. This ranges from automatically recognising a driver and adjusting seating and lighting preferences, creating individual sound bubbles, simplifying interactions via voice, gesture or touch, to proposing multi-sensorial wellness programmes that relax or revitalise occupants. Faurecia’s CIP is connected to the cloud, enabling the system to securely store and access on and offline data to ensure a continuity between home, office and in-vehicle services through edge computing.

Faurecia has taken a services-oriented approach. The CIP is built on an open source Android platform to support the development and integration of new apps and services. In addition to being highly connected, it’s also scalable and upgradable. This allows automakers to choose which functionalities to integrate in each category of vehicle, as well as upgrade over the air new features to keep vehicles state of the art over their lifetime. Faurecia’s CIP features a number of key specialist technologies, including the software and electronic audio, infotainment and connectivity services of Parrot Faurecia Automotive and Faurecia Coagent Electronics.

Auto Components India Bureau

CES 2019





TECHNOLOGY

Report

VISIONARIES INVENT INDIA'S FIRST FLYING BIKE



ASIA'S FIRST EVER FLYING BIKE

Tired of waiting at traffic jams and relentless honking? Wouldn't it have been better if you could just fly over the congestion? Students from the Hindustan Institute of Technology and Science in Chennai have been working on a project just for that.

A student start-up Jhatayu, mentored by Assistant Professor C.S.Karunakaran, School of Aeronautical Sciences, Hindustan Institute of Technology and Science in Chennai has made Asia's first ever flying bike. A crowd-funded, MSME registered student start-up company, Jhatayuis a team of 35 undergraduate students from the second year and final year of the institute mentored by Karunakaran. They have currently built an unmanned version of its flying vehicle which has earned them a place in the pages of India Book of Records for their invention "First Flying Bike".

The core committee members are Mr. Yashwant, CEO; Ms. Massey. M, Vice President; Mr.Gowtham. Ch, Vice President; Mr.Gowtham V, Vice President; Mr.T.Vinay, CTO; Mr. Sri Harsha, Director; Mr. Rishabh Agarwal, CTO and Srikanth P. Dy. Director. NASA Astronaut Dr. Michael Barratt had also awarded the team, last September at IIT Guwahati, the IAAA's Award - "Best Innovation" and "Best International Mentor". Mr.C.S.Karunakaran gave an invited lecture on topic "First Flying Bike"

at International Two Wheeler Conference organised by SAEINDIA during August 2017 at PES University, Bangalore. Mr.C.Prakash, Training and Development Specialist, Ashok Leyland and Mr.Javaji Munirathinam, Chairman, Aerospace Board, SAEINDIA awarded him during the conference.

Karunakarn says "India is demonstrating its supremacy in Space Technology, Automotive, Nano Technology, Pharmacy, Agriculture and IT. Benchmarks and indigenisation in commercial aviation have been a debatable topic in Indian technological development for the past four decades. Lack of connectivity between industry and academics and lack of skill were major impediments, besides the investment bottle-necks. An aerospace manufacturer requires a period of 15 years to make its breakover its investment but the mean life of a corporate may be between 7 to 9 years. This has made people believe that private investment in aeronautical manufacturing is impractical. An unsung optimistic sign in Indian aerospace sector is the rapid growth of academia and skill training industries. The potential of aerospace training industry is driving new initiatives through public private partnerships especially in the area of skill training."

Enlightening the student community and helping

TECHONOLGY

Report



FLYING OUTDOORS

them to transform their thought process towards entrepreneurship is going to play a key role towards India's future technological prosperity. Professional students should be given exposure towards industry trends. Training curriculum should be designed to ensure students practise industrial engineering and entrepreneur skills. Professionals involved in teaching sector should realise this gap and should start mentoring students towards these traits.

The student start-up has involved in building Asia's First Flying Two-wheeler Bike which was an original concept of Professor C.S. Karunakaran. The start-up aims to contribute and motivate the idea of entrepreneurship among young technologists.

The start-up has built an unmanned version of its flying

vehicle. The start-up has applied for its patent and planning to raise funds for its manned version. The start-up is also planning to apply for Asian certifications to support its claim of being Asia's First Flying Two Wheeler Bike.

The electric bike consists of an aluminium double-dashed H section, custom built foam reinforced frame and four 350kv brushless motors capable of lifting 20 kgs, tested at the institute's premises on October 27, 2018. "The vehicle can travel at a speed of 30 kmph and is capable of clocking a 40kmph as well," says Karunakaran. "Till now it has flown up to 20 metres high. We would need permission to fly above that height," he adds.

Karunakaran says that he had been planning such a



NASA ASTRONAUT DR. MICHAEL BARRATT AWARDED THE TEAM

TECHNOLOGY

Report

project for a long time but it would have not been possible if the students were not so passionate about it. "They were in their first year when we started the project in 2016. We had completed the conceptual design in 2017 itself," says Karunakaran. He kick-started the project with a personal loan. "We are working on our patent and will be looking for financiers soon," he says.

"Enlightening the student community and helping them to transform their thought process towards entrepreneurship is going to play a key role towards India's future technological prosperity. Students of professional courses should be given exposure to industry trends. Training curriculum should be designed in such a way that it ensures students practise industrial engineering and entrepreneur skills. Professionals involved in teaching sector should realise this gap and should start mentoring students towards these traits," Karunakaran says emphasising on the fact that entrepreneurship should be encouraged in colleges across the country. It is notable that Karunakaran himself is being catalyst of change in the Indian Aerospace Academic Activities. He is also known for his research works with various aerospace industries including NASA. He envisions to bring various skill centres across the nation, involving large industry contributions and start-ups to develop Indian academic sector. With his humongous efforts he launched SAE International's Aero Design competition in India through



AWARD FOR LECTURE ON FLYING BIKE

SAEINDIA Southern Section in the name of Aero Design Challenge during 2016. His contribution to Aeronautical Society of India (AeSI) and Institute of Aeronautics Astronautics and Aviation (IAAA) has also inspired lot of young minds including students from IITs.

Flying bikes have been manufactured earlier also, but not in Asia - British creators, John Fordon, 37, and Yannick Read, 42 with Para motor fitted flying tricycle on June 2013; three Czech companies made a prototype of an electric bicycle that successfully took off inside an exhibition hall in Prague and landed safely after a remote-controlled, five-minute flight on June 12, 2013.

R. Srinivasa Raghavan



THE TEAM BEHIND FLYING BIKE

TRACK AND FIELD

The Internet of Things and vehicle telematics are the new frontier for smarter transportation, what with connected vehicles working as mobile hotspots. With AIS 140 norms having kicked in from January 2019, GPS tracking companies are eyeing a tidal wave of growth



Even as modern-day vehicles increasingly become tech centres on wheels, there is a limit as to the extent of how much technology can be packed into cars, two-wheelers and buses. Automotive engineers have to ensure that the tech-laden vehicles are safe to operate while on the road and at the same time also offer high standards of convenience and connectivity functions which motorists have come to expect in today's age of internet, mobile phones and other portable devices.

With the era of IC engines evolving into an entirely new generation of electric and other forms of sustainable mobility solutions, vehicle manufacturers as well as technology providers find this change as an opportunity to begin from a clean slate and offer highly contemporary digital tools for in-vehicle entertainment and connectivity, which would also communicate to the surrounding infrastructure and other vehicles on the road by the virtue of V2X (vehicle to everything) and V2V (vehicle to vehicle) communication in an attempt to enhance vehicle and road safety.

Therefore, Internet of Things (IoT) and vehicle telematics have become highly commonplace tools at the design and R&D centres of technology leaders which are conceptualising mobility technologies of the future and looking to offer cutting-edge systems inside cars, commercial vehicles as well as on two-wheelers.

The starting point of this vehicle connectivity wave has been through vehicle tracking and geo-fencing GPS

devices which enable vehicle owners, both private as well as fleet operators, to keep track of their asset on wheels. These devices, which connect online using a mobile network operator's SIM card, can determine a vehicle's immediate location using the built-in GPS, its speed with the accelerometer and beam the entire data across in real-time to the server hosted by the device manufacturer, from where it is processed and routed to the end-user or vehicle owner to locate the vehicle.

At present, leading component manufacturers such as Minda Industries and Motherson Sumi Systems are seen to be diversifying into this newfound space, having established separate entities — MindaiConnect and Motherson Sumi Infotech and Design (MIND) — to cater specifically to the growing connectivity needs of the automobile industry, but the fresh canvas has also opened a tunnel of opportunity for start-ups from the technology space to enter the arena and offer their products. The only difference is that the larger players have a lot of risk appetite to sustain in a field which is still to unravel its true potential.

Track N Tell, a Gurgaon-based start-up which started off with this idea in 2008, has been working in the space for the past decade. It currently sells a vehicle tracking device called Intelli 7 that offers seven different location tracking features to operators running cab fleets in call centres in the business district in the National Capital Region.

While its major customer group comprises fleet operators, who account for over 60 percent of the total 50,000 units that the company has sold thus far across India, it is reporting a high level of interest from the private customer, who is piqued by the safety functionality offered by these IoT devices, making them feel secure when a loved one is out on the road in the vehicle.

Track N Tell is now expanding to the next stage of technology — intra-vehicle connectivity systems — with

TECHNOLOGY

Update

its Intelli Play, a seven-inch touchscreen infotainment system, which offers audio-video and navigation support as well as doubles up as a real-time vehicle tracker with an integrated 4G WiFi hotspot, running an operator SIM card. The system also offers features such as on-board flash memory, built-in odometer, and a network agnostic two-way calling and eavesdropping feature, which is a popular requirement in the logistics industry.

According to Pranshu Gupta, founder and CEO, Track N Tell, "Apart from being a vehicle and asset tracking company, we are now an infotainment company as well and Intelli Play is a first step in the direction of a lot of futuristic products to come out from our end. The Intelli Play with integrated GPS tracking system is priced at Rs 40,000. As a standalone unit, it will be available for Rs 12,000."



PRANSHU GUPTA, FOUNDER AND CEO, TRACK N TELL

Scaling up with new AIS 140 regulations

Track N Tell is now looking at a tidal wave of sale of these devices under the new AIS 140 (Automotive Industry Standards 140) norms. These essentially

30 seconds on... An AIS 140 conforming device should...

- Be capable of obtaining information using Global Navigation Satellite System (GNSS), including support for GAGAN, the Indian satellite-based augmentation system.
- Support 4 digital, 2 analogue and 1 serial communication for interfacing external systems (for instance emergency request button interfacing).
- Have the capability to transmit data to the back-end control server (government authorised) using a GSM/GPRS network. It needs to be capable to transmit position, velocity and time along with the direction to the server.
- Transmit data to two different IP addresses (minimum) and additional one IP address for emergency response system. It should have an emergency/panic button that transmits alert (once pressed) to the configured IP address(s) as per the protocol.
- Have an internal power backup of at least four hours. It needs to be capable of transmitting data alerts to the back-end server; and support for over-the-air (OTA) software and configuration updates.
- Support basic standard configuration (mobile communication network, back-end control server, details, data frequencies, alert thresholds among others). The device needs to support storage and forwarding mechanism for all types of data.
- Have a unique identification for identifying the device and data, including the vehicle registration details (non-volatile memory). The device will have an embedded SIM card; operate between 8VDC and 32VDC using vehicle battery voltage input of 12/24 volts.
- Have a multi-slot GPRS with in-built quad-band GPRS module with a lifespan of at least 10 years life and more than 1 million read/write cycles.
- The device needs to be dust-, temperature-, vibration-, water-splash resistant, IP 65- rated or better and tamper-proof. It will also need to support A-GPS (Assisted GPS), with provision of secured data transmission to the Backend Control Centre through secured channel (for instance secured dedicated APN). It needs to have three-axis accelerometer and three-axis gyroscope for getting the alerts on harsh braking, harsh acceleration, and rash turning.



TECHNOLOGY

Update

are a set of standards formulated by the Automotive Research Association of India (ARAI) aimed at building an Intelligent Transportation System (ITS) in the country and mandate the fitment of such vehicle tracking devices along with a panic emergency response button in public transportation systems including passenger-carrying CVs like three-wheelers, buses, autos and cabs.

Although the regulations first came into effect from April 1, 2018 and were supposed to encompass all public vehicles — new and old — but the lack of sufficient State-held command and monitoring centres led to an extension until April 2019. However, the Ministry of Road Transport and Highways, in a notification dated October 31, 2018, exempted existing vehicles until further notice and made it mandatory for only the new vehicles being registered on or after January 1, 2019 to be conforming to the mandate.

AIS 140 norms will catalyse demand for tracking device companies in India as they would help remove the clutter from the market. At present, the aftermarket is flooded with cheap Chinese devices which do not conform to cybersecurity protocols and put user data at risk.

These regulations demand such GPS devices to come fitted with a multi-operator SIM card which will be required to be soldered inside the PCB module at the time of manufacturing and the GPS devices will also need to be certified by ARAI and iCAT on the parameters of waterproofing, electromagnetic radiation, build quality and performance under varying temperature conditions as observed across the country.

Incorporating fool-proof encryption logics into the data flow, Gupta mentions that both Intelli 7 and Intelli Play are purely one-way communication devices and only take inputs from the vehicle's ECU and beam it to the cloud. They cannot work otherwise to hamper the ECU's programming by downloading spam from outside, he points out.

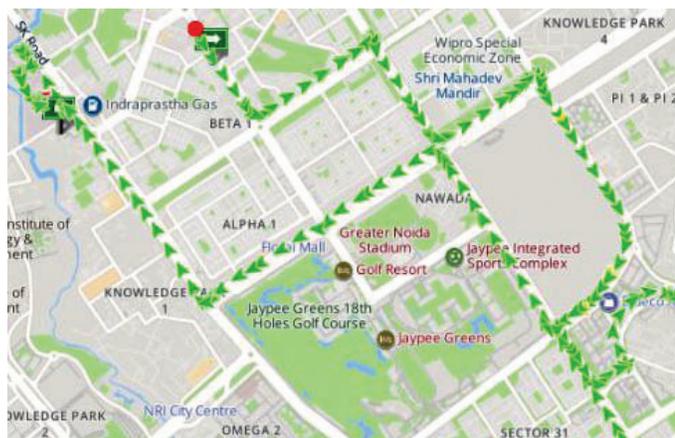
"Track N Tell had started local sourcing of its chipsets and PCBs in 2011, and we still keep the schematic layout and circuit designing all in-house. Chinese devices typically do not have any encryption, which is why they are priced on the lower side. Furthermore, the absence of regulatory standards in the vehicle telematics and IoT space up until now has also kept central agencies

such as the IRDA from utilising these devices to offer customised insurance premiums," he mentioned.

"The challenge of price sensitivity is going to remain there in the Indian market for quite some time in the coming future," says Gupta, who sees his company making headway with some commercial and passenger vehicle manufacturers. Two-wheeler OEMs though are still shying away from bringing the technology to their products and what inhibits that is the seemingly higher hardware cost in case of application in the two-wheeler segment as the basic cost of hardware remains the same.

MapmyIndia

Delhi-based premium navigation maps supplier MapmyIndia too has tapped the opportunity to diversify into vehicle tracking devices. The company introduced two of its AIS 140-compliant GPS tracking devices on January 9 and plans to build upon more vehicle telematics features in the future. The more advanced of the two AIS 140-compliant devices comes loaded with



RAKESH VERMA, FOUNDER & MANAGING DIRECTOR, MAPMYINDIA

TECHNOLOGY

Update

MapmyIndia's telematics platform 'InTouch' integrated with the detailed MapmyIndia maps empowering all commercial vehicles with live tracking, route creations, geo-fence management and real-time alerts. The device also goes beyond just vehicle tracing and reports on the engine vitals, driver behaviour, drive history as well on optional basis.

According to Rakesh Verma, founder and MD, MapmyIndia, "MapmyIndia has always been at the forefront of introducing products and solutions that have made travel safer, smarter and productive. We are happy to contribute to the government's mission to make travel safer for Indians with our solutions. We are bringing both standard and CAN-based devices to also support use cases around predictive maintenance for large fleet of vehicles. These are powered by MapmyIndia maps. We have also leveraged on our vast and varied experience with leading automotive companies and our deep understanding of the Indian terrain to develop these products."

The tracking product consists of GPS tracking device, one SoS button, embedded SIM card (one-year subscription) and accompanying web and mobile applications (Android and iOS) for easy, anytime and anywhere access.

Let's track

Another start-up in the same field is the UK-based Letstrack, which was founded in 2015 with an initial funding of half-a-million pounds (Rs 4.5 crore), and later ventured into India and started its operations in the country in August 2016. The company too sees close to 80 percent of its volumes coming in from the B2B space and has cumulatively sold over 150,000 devices in the country so far with states like Uttar Pradesh, Andhra Pradesh and Arunachal Pradesh gaining maximum traction. It has a widespread retail network of over 3,000 accessory dealers selling its products, which are very nominally priced between Rs 4,500 and Rs 10,000.

While the company has full control over the software, like Trak N Tell, it outsources the hardware of these devices as well, with an in-house team taking care of the aftersales support. While cab aggregator companies such as Uber and Ola, along with general insurance providers L&T and Kotak Mahindra form its major clientele, it has recently inked an agreement with the



MR. VIKRAM KUMAR- FOUNDER- LETSTRACK

Auto Union in Karnataka to equip close to 1,000 vehicles in the state with these tracking devices, as per the requirements under AIS 140.

Leveraging the opportunity, Letstrack aims to expand the same to Tamil Nadu and Andhra Pradesh as well and targets 10,000 devices to be fitted into these commercial public carriers in 2019. The company is also betting big on venturing into the neighbouring countries within the Indian sub-continent with sales commencing in Sri Lanka, Bangladesh, Nepal and Bhutan by early 2019. The bigger proof of the success, however, will be defined when it is able to successfully enter the US market in April 2019 and retail through Wal-Mart and online through Amazon.

As mandatory regulations create a foundation designed to drive growth and penetration of these GPS systems in commercial vehicles, their mass proliferation with private buyers will still remain dependent upon the general public getting acquainted with their safety benefits which add a layer of security to a vehicle's ecosystem.

Will it come from an OEM push, or will consumers themselves demand these advanced technologies as they get more and more tech-savvy? Only time and the market response will tell but clearly, IoT and telematics have the potential to shape up the future of road transportation and how vehicles evolve to become much more than just basic means of commute in the future. CES 2019, the world's leading tech show held in Las Vegas earlier this month, shows how technology continues to disrupt the automotive world.

Mayank Dhingra
Autocar Professional



INTERVIEW

DR. BALA K BHARADVAJ

The dynamic aircraft and automobile industries boast interesting technologies and processes. In an increasingly competitive and disruptive age, there could be an increase in the confluence of technologies and best practices of the two industries.



Interview with Dr. Bala K Bharadvaj, President, SAEINDIA and MD, Boeing India Engineering & Technology Center.

SIAT 2019 had a concept electric vehicle where there's use of battery technology used in space shuttle. Is there a growing scope for usage of space/aviation technology in the automobile industry?

There is a convergence of technologies happening. What we used to think of as exclusive to aerospace only, and many of the things that we think about or talk about very passionately specific to cars, these are either technologies that already have a certain level of history in outer space or they are also being pursued in outer space.

Managing the traffic on the street is one kind of traffic. But we have an exactly similar problem with the traffic in the skies. We are also working on advanced air traffic management. Because you want to become more efficient, you want to use the sky that is available to you to be more efficient.

On the ground, the number of vehicles has gone up. The road is only so much. Even in the sky, the number

of airplanes has gone up, and the channels you have, through which people travel from one city to another is also limited. So there are similarities. You can say one is aerospace technology and the other is automobile technology. It is a technology that is applicable to both places and in some situation we can actually collide. In some cases, the differences are so much that it doesn't really offer or make it easy for a platform and in those cases it makes it easy for collaboration.

We are seeing more and more instances of the sharing of technologies in both ways. Which are the areas or opportunities for collaboration in the coming years?

Safety, for example, is one area. Aerospace is very much focused on safety. It is not so strong on the automobile front. Of course, the way you operate automobiles is very different from the way you operate an airplane. In an airplane, you have pilots who are extremely well trained. So, the safety aspects are managed because of the way you train the individual. But the airplane is also much more complicated. In a car, if you know how to drive one car, it is not that difficult to figure out how to drive another car. But if you know how to fly a 737, it does not mean that you can fly an Airbus aircraft. They are of similar size but the setup is very complicated and quite different. So, it may not be that easy to translate.

But when you talk about some of the maintenance-type issues, we have this idea of collecting the data, and with that data we can predict what kind of maintenance you do. That is done in aircraft today. Similar concepts apply. For example, the timing belt. The timing belt is difficult to change but it is also an important element. If that thing breaks, then your whole car is paralysed. So you visit the dealer and you know 60,000km has been clocked and it's time for a replacement. Is it really necessary to replace or will it run for another 20,000km? You have no idea. You are simply replacing it because somebody decided that beyond a certain point it is more and more risky. So you don't take the risk, you replace it. In the olden days, that is what happened



INTERVIEW



787-8 DREAMLINER

with aviation customers also. The whole replacement schedule was based on the aircraft having flown for so many hours. But today that whole concept has changed. Today, we don't simply replace because the time has gone. You also make measurements, you detect how good the part is. So there is a whole concept of prognostics. So the same principles and the same ideas can apply to automobiles as well.

For example, we measure many things in a car, many things in the aircraft too but measuring itself is not enough. We have to do something with the measurement. I am collecting 50 pages of data from the car. I might be getting 500 pages of data from an aircraft. That is the only difference. But what do you do with these 50 pages of data or with the 500 pages of aircraft data? There is something else which many people are not sure about — is it aerospace technology, automobile technology, or data analytics technology?

This is where there is a confluence happening. There are technologies being developed and different people will stake claim. An IT company will claim that this is all ours because data is there and we are the ones who manage the data. But the data is there for a purpose. If you go to the purpose, IT to me is an envelope. But if I am going to be working in an IT company, I will think you know that data is my proprietary thing. This is the thing that I do. So whether you know automobile or aerospace, it doesn't matter. This data is what I am contributing, so it is a big deal. So we have to get past this idea that this is automobile engineering, aerospace technology, robot technology or IT-related technology. Technology exists to improve the product, to make life easier for somebody else, for our customers. It does not matter where it comes from. If you are smart, you will take all the different pieces and put them together.

64 MARCH 2019



DBS SUPERLEGGGERA-AXENON GREY

Also, talking about the trend of electrification, how is the proliferation of electric technology likely to take place in the aviation industry? There's already news about electric aircraft being developed.

The problem here is a little more complicated. For example, the whole idea of solar cells which have been used in satellites. In fact, Boeing has a division where we manage solar cells. Boeing uses those in their satellites and even sells those cells to ISRO. Because when you are up in the sky, you need electricity. Solar energy is available in plenty. That was the thought process. But when these technologies got started, they were very expensive. Today, I can put them up

on the roof of my house and generate electricity.

Electrifying an aircraft has different challenges as compared to electrifying a car. So the principle is there. We even have examples where an electric aircraft has been demonstrated. But demonstrating is a far cry from actually doing it in a large scale where it can be commercialised. So there will be differences, but the principles are carved. That is where you can look at the overlaps. Batteries for example. If you want to make electric cars, a bunch of batteries is what you need. We also have batteries in aircraft. You need batteries even in homes. We are going to have a generous amount of energy. What are you going to do with it? You are going to have to need to have to store it somewhere. So there are things like that where there is commonality between interest in the aerospace industry, automobile industry and even the housing industry. So that is where we have to look for confluence.

Sumantra B Barooah
Autocar Professional

MOBILITY ENGINEERING



High precision and performance - *Delivered worldwide!*

Dual station shock absorber performance testing machine

The dual station shock absorber testing system is a high productivity test system specially designed for testing shock absorber / strut / front-fork in the production line. This machine ensures the assembled shock absorber meets required performance specification. It is the result of two decades of R&D with a focus on harmonizing production line test requirements for 2, 3 and 4-wheeler suspension components. Individual features of the Dual Station have been tested and proven by all major shock absorber manufacturers across the country. Almost every shock and strut manufactured in India are tested on BISS machine, testing over 2 million parts a month.

BISS is a subsidiary of ITW-India and part of the Test and Measurement Business Division of ITW, USA. More than 25 years, BISS is proudly associated with automotive industry worldwide in developing and manufacturing of a variety of servo-controlled test systems to evaluate the quality, performance and durability of automotive components and sub-assemblies.

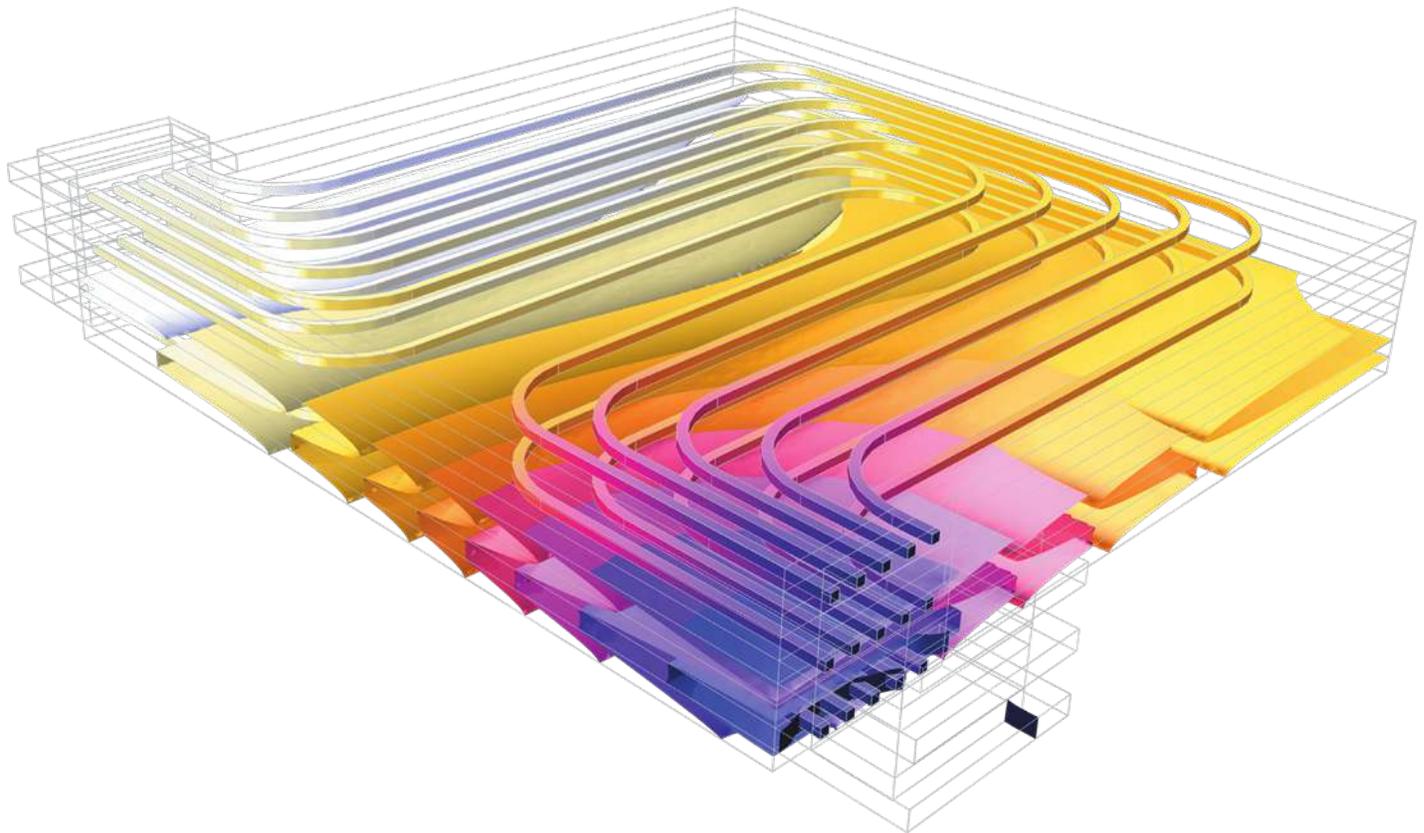
Standard features

- 5 to 15 kN dynamic force rating
- Velocity rating 0.005 to 1.5 m/s
- Self aligned top pneumatic and bottom hydraulic grips
- Quick change of jaw faces and spacers to switch between the parts
- Tooling to test unsealed parts
- Low-force "bull-dog" top grip to avoid damage
- Top and bottom tooling to suit threaded, rod eye mounts
- Tooling suitable for 2, 3 and 1-wheeler parts



For details please contact:
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Autonomous vehicles require batteries with lasting power.



Visualization of the temperature profile in a liquid-cooled Li-ion battery pack.

The stage of the load cycle, potential, local concentration, temperature, and direction of the current all affect the aging and degradation of a battery cell. This is important to consider when developing autonomous vehicles (AVs), which rely on a large number of electronic components to function. When designing long-lasting batteries that are powerful enough to keep up with energy demands, engineers can turn to simulation.

The COMSOL Multiphysics® software is used for simulating designs, devices, and processes in all fields of engineering, manufacturing, and scientific research. See how you can apply it to optimizing battery designs for self-driving cars.

comsol.blog/autonomous-vehicle-batteries