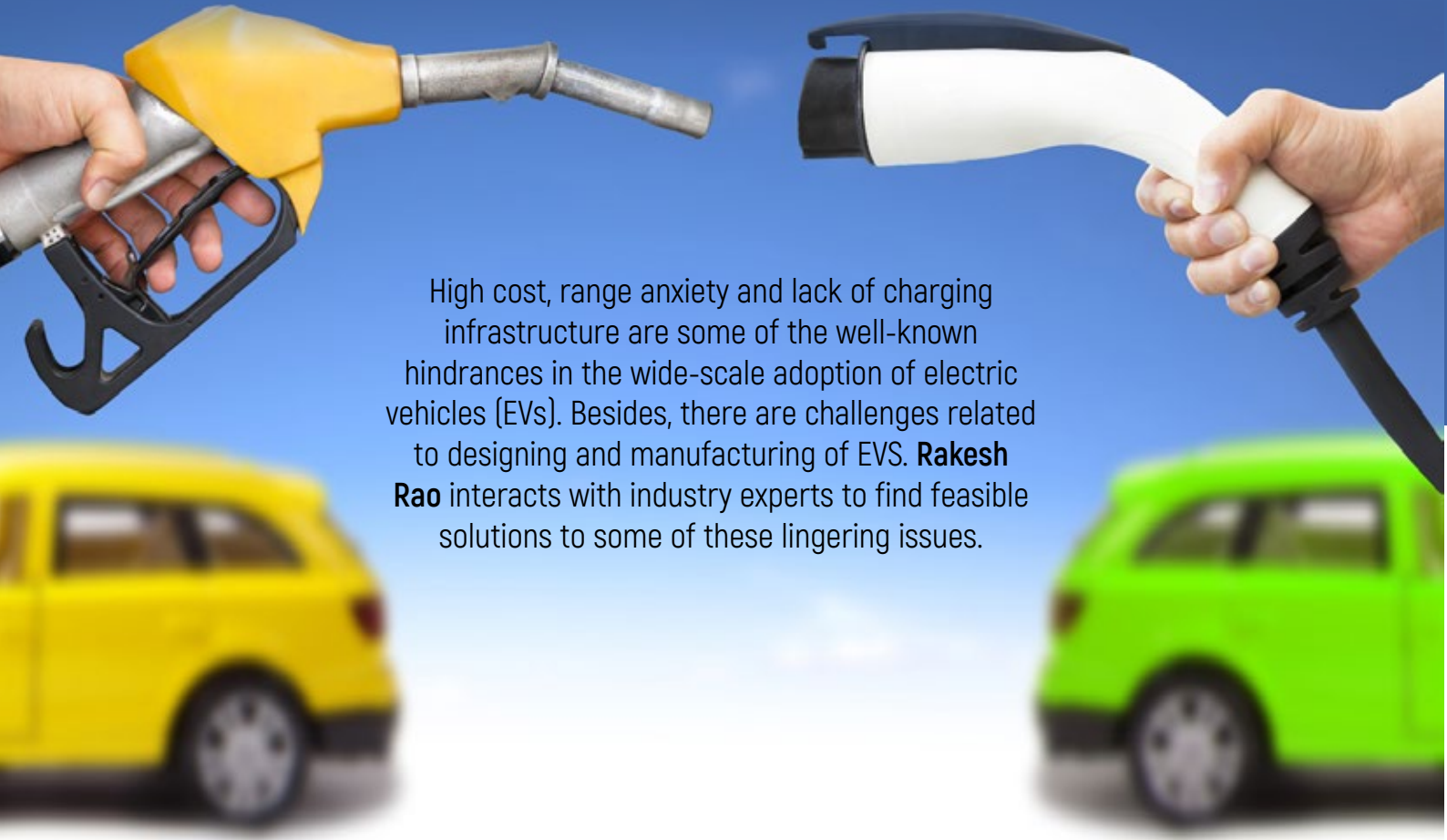


# Electric vehicles industry

## All charged-up!



High cost, range anxiety and lack of charging infrastructure are some of the well-known hindrances in the wide-scale adoption of electric vehicles (EVs). Besides, there are challenges related to designing and manufacturing of EVs. **Rakesh Rao** interacts with industry experts to find feasible solutions to some of these lingering issues.

**I**n June this year, the Chinese start-up firm **NIO** started the commercial sale of ES8 - its first electric, all-aluminium vehicle developed in association with India's Tata Technologies - a part of the Tata Group that also owns Tata Motors. Since mid-2015, Tata Technologies has been engaged with NIO to drive major engineering aspects related to the development of ES8, such as body structures, closures and exteriors, advanced manufacturing engineering, PLM and off-car connectivity.

NIO ES8 is not an ordinary one. It

broke lightweight index benchmarks and evolved from inception to road-ready vehicle in record time. "Tata Technologies' 5R Rightweighting methodology is a tried and tested formula that delivers the Right Performance at the Right Price, by applying the Right Amount of the Right Material in the Right Place. Our recent claim to fame is the delivery of the Nio ES8, the all-aluminum EV from China that has broken benchmarks of even German OEMs," claims Anand Bhade, President - Asia Pacific Sales & Global Marketing & Communications, Tata Technologies.

Electric vehicles are gaining traction

in India with the primary aim to reduce greenhouse gas emissions and dependence on oil imports. "While the digital and electrical revolution in the automotive industry is encouraging, it also places a lot on the shoulders of automakers and their engineering partners to deliver the best and do it ahead of time. For the major established car makers, phasing out internal combustion engines (ICEs) and electrifying their entire fleet implies substantial challenges," opines Anand Bhade.

Investment challenges to the extraction of raw materials needed for battery production are emerging as a critical issue.



Widely available charging stations and increasing consumer acceptance are also the critical factors for replacing conventional transportation in India. He states, "Administrations around the world are laying down stricter standards for fuel efficiency, CO2 emissions and this is the context that makes lightweighting an absolute necessity. Technically speaking, there are several ways to reduce CO2 emissions and improve fuel economy of a vehicle overall, but there is none as cost-efficient as reducing vehicle weight."

### **LIGHTWEIGHTING: IS AL THE ANSWER?**

Still now India has not reached the volume for any mass manufacturing activity for EVs, thus resulting in cautious investment. "It will take time for volumes to pick up. Another challenge is the lightweighting of the vehicle vs the cost of manufacturing. The lightweighting is possible with aluminium and many of the leading EV OEMs are already using aluminium in western countries. The knowledge, expertise, infrastructure, manufacturing cost and capital investment for processing equipment for induction of aluminium part is still not explored well in India and this will happen as the volume increases," says V V Kamath, Managing Director, Fronius India Pvt Ltd, which is active in the fields of welding technology, photovoltaics and battery charging

technology.

While globally OEMs are increasingly turning to aluminium for lightweighting, there are a plenty of challenges in welding aluminium. Aluminium is fast conductor of heat and, since the possibility of distortion is high, it requires different clamping jig & fixtures.

Kamath explains, "Aluminium does not change colour when heated, making it difficult to know if it is overheated. Hence, less heat input is required. Also, the aluminium oxide layer has higher melting point than the aluminium and this makes the welding process difficult. For several decades, Fronius has handled these difficulties very well and made technologies in welding of aluminium. Today in this county maximum aluminium radiators, defence bridges, Coast Guard interceptor boats, aerospace components & scaffolding of buildings and many more aluminium components are welded using Fronius aluminium welding technology."

As companies in India also turn to aluminium for making car parts, Fronius - which provides welding solutions for premium cars like Audi A8, Mercedes AMG and Tesla Electric S Model - is bullish about growth in India. "Maximum battery housing across the globe are produced using Fronius technology. So we are all geared up for welding of aluminium and willing to transfer the technology to OEMs and tier 1 & 2



## **While the digital**

and electrical revolution in the automotive industry is encouraging, it also places a lot on the shoulders of automakers and their engineering partners to deliver the best and do it ahead of time.

**- Anand Bhade,**  
*President - APAC Sales & Global Marketing & Communications, Tata Technologies*



## **The knowledge,**

expertise, infrastructure, manufacturing cost and capital investment for processing equipment for induction of aluminium part is still not explored well in India and this will happen as the volume increases.

**- V V Kamath,**  
*MD, Fronius India Pvt Ltd*

suppliers. Some of the OEMs are already shifting to aluminium parts in India and a few of the two-wheeler makers are also looking forward to use aluminium solution from Fronius," informs Kamath.

Solution providers like Fronius are eyeing huge opportunities in the EVs space in India. "Fronius has expertise in providing total solution for lithium ion



## Lightweight

aluminium alloys will be used to reduce BIW mass and these materials will have to be welded, rivetted or glued by using special technologies including laser which are best implemented using robots.

- **Vikas Swami,**  
VP, KUKA Robotics India  
Pvt Ltd



## Electrification of

automotive systems presents significant design challenges too. EVs are complex mechatronic systems and their design requires holistic consideration.

- **Manoz Kumar M Tirupati,**  
Chief Engineer (Automotive  
Systems), Tata Elxsi

battery box housing (including the robot, power source, cell and technology transfer). Fronius is the only company that has the technology to join steel with aluminium. In the two-wheeler segment, we have special process for aluminium frame and offer the same for the lighter and aesthetic frames," says Kamath.

### ROBOTS: LENDING A HELPING HAND

Some of the challenges involved in the



manufacturing of EVs are charging stations, battery life and new material which will be used in body in white (BIW) manufacturing. BIW refers to the stage in automotive design or automobile manufacturing in which a car body's sheet metal components have been welded together. Manufacturers are using robotic technologies for solving some of these manufacturing challenges. Vikas Swami, Vice President, KUKA Robotics India Pvt Ltd, explains, "For volumes, robotics can play a major role as they can offer complete assembly lines for batteries where online inspections can be added with the help of artificial intelligent (AI). Additionally, lightweight aluminium alloys will be used to reduce BIW mass and these materials will have to be welded, rivetted or glued by using special technologies including laser which are best implemented using robots."

Companies like KUKA are already offering new joining solutions which include composite welding, laser welding, battery assembly lines and standalone cells. "Mobile robotics along with human robot collaboration is introduced in assembly lines to take out workforce from shop floor logistics and use them in more productive work where their cognitive skills can be better used," informs Vikas Swami.

### BACK TO THE DRAWING BOARD

It is not just manufacturing, but even vehicle designing will need a different

perspective for EVs. Electric cars must be designed from ground-up; simply retrofitting existing car bodies with new batteries and components would not do. The design process for the electric vehicle is different as the driveline architecture, power source and vehicle dynamic parameter requirements are completely different from internal combustion engines (ICEs). Some of major components required for EVs are high voltage traction batteries, AC/DC motors, torque converters, power electronics and control modules like inverter/controller, DC-DC converter, BMS, chargers etc.

**Manoz Kumar M Tirupati, Chief Engineer (Automotive Systems), Tata Elxsi, elucidates, "Compared to a modern electric drivetrain, ICE is far more complex. It requires a crankshaft with counterweights to translate the linear motion of the pistons into rotational motion, a flywheel to smoothen the power output, a starter motor for cranking, an alternator to charge the battery, a cooling system, an exhaust system and a host of other gadgets that an electric motor doesn't need. An induction motor, which produces direct rotational motion and uniform power output, is smaller, lighter and far beyond NVH performance, and does not need a complicated transmission to connect it to the drive wheels."**

Vehicle electrification has been increasingly recognised as the most promising road transportation solution for both the global energy crisis and





# AUTO20 CONNECT 18

Automotive Logistics Conference



15<sup>th</sup> October 2018 | JW Marriott, Pune

## India's largest gathering AUTOMOBILE LOGISTICS PROFESSIONALS

### 250+ DELEGATES

#### PANELISTS

**MINISTRY OF RAILWAYS** (Confirmed Participant)  
**KALPESH PATHAK**, Sr. Vice President - Corporate SCM and Business Development, Fiat Chrysler Automobiles  
**ANAND VENKATESWARAN**, Sr. General Manager- Sales Logistics, Hyundai Motor India Ltd  
**MANDEEP WALIA**, Head- Supply Chain Management and Logistics, Mahindra Trucks  
**ADITYA SHAH**, Executive Director, V-Trans India Limited  
**XAVIER BRITTO**, Chairman, Kerry InDev Logistics  
**AKASH BANSAL**, Country Head- Logistics, Om Logistics Limited  
**JITEN MUNOT**, Head- Sales Admin and Logistics, Force Motors  
**NIDHISH KUCHHAL**, General Manager- Demand Chain Management, Mahindra & Mahindra  
**SUSHIL RATHI**, Chief Operating Officer Mahindra Logistics Limited  
**VIPUL NANDA**, President, Car Carrier Association  
**JAYAPRAKASH LOGANATHAN**, Senior Manager- SCM, J.K Fenner (India) Ltd  
**ACHAL PALIWAL**, Chief Executive Officer - TMLD Co. Ltd, Tata Motors  
**PRABU NITHYANANDHAM**, General Manager- Asia Pacific Logistics and Customs, Ford Motor Pvt Ltd  
**KRISHNADHASAN (K.)**, Vehicle Logistics Operations, Ford Motor Company



#### INDUSTRY PARTNER



#### GOLD PARTNER



#### SILVER PARTNER



#### MEDIA PARTNERS



### 5 PANEL DISCUSSIONS 30+ SPEAKERS

**AJEET KUMAR**

+ 91 9810962016

ajeet@surecommmedia.com

**SMITI SURI**

+ 91 9711383365

smiti@surecommmedia.com

**MEHULI CHOUDHURY**

+ 91 9810730347, 8700292866

mehuli.surecommmedia@gmail.com

**RAHUL ARORA**

+ 91 9899211616

rahul.surecommmedia@gmail.com

[www.autoconnect.co.in](http://www.autoconnect.co.in)

increasingly stringent requirements related to environmental protection and vehicle safety. However, the biggest challenge for the electrification technologies is that it requires to maximise the energy efficiency and effective integration of power electronics, without sacrificing performance, cost-efficiency and safety.

"Electrification of automotive systems presents significant design challenges too, specifically related to drivetrain systems, chassis design and layout, multi-disciplinary power management and optimisation, system integration, and vehicle dynamics and control. Electric vehicles are complex mechatronic systems; their design requires holistic consideration of the vehicle and tyre dynamics, powertrain, electric motors and batteries, and control and estimation modules," says Manoz Kumar.

Owing to firmer emission regulations, ideal fuel efficiency numbers and the drive towards creating a sustainable future, the automotive industry has been undergoing a huge transition and electric vehicles is a part of this change. Additionally, the demand for hybrid electric vehicles has been at its peak due to rising fuel prices. There has been an increasing demand for

HEV/EV solutions in the market.

Tata Elxsi has been extensively working in various aspects of the electric vehicles space especially in powertrain development, from program management to calibration and software development. Tata Elxsi also partners with leading OEMs and suppliers in green initiative programs. Manoz Kumar elaborates, "Our hybrid vehicles enable customers to develop clean automotive solutions in the areas of requirement engineering, technical consulting, algorithm development, model-in-loop testing, software-in-loop testing, and production level ECU prototyping, hardware-in-loop on the component level, integration, and system level validation. Tata Elxsi has successfully created methods and techniques to provide architectural solutions and incorporate safety integrity functions in compliance with ISO 26262."

#### CHARGING CONUNDRUM

Electric vehicles face three rudimentary challenges across the world - long charging times, range anxiety (limited driving range) and high upfront cost. To overcome this, various models of charging like fast charging and battery swapping are being mooted across the world. But for a country



## For a country

like India, with a diverse transportation system, different energy solutions for different applications need to be considered. Whatever the mode of charging, it is necessary to ensure that cost economics are viable for the end user.

- Yuvraj Sarda,  
Sr Manager (Business  
Development & Strategy),  
Sun Mobility

as vast like India fit-for-all solutions may not be practically possible.

"For a country like India, with a diverse transportation system, different energy solutions for different applications need

### OEM PERSPECTIVE



Could you please share the experience of Lohia Auto Industries in EVs?

Our experience in EV has been full of new learnings. Though it is more than a decade old in India, EV industry is still at

## "EVs have huge potential in India"

...says Ayush Lohia, CEO, Lohia Auto Industries

a very early stage, looking for the basic solutions which can give some strength and power to hold its ground in the Indian automotive sector. Customer response and demand has been good under FAME I but still customer awareness, infrastructure and government long term policy has been the challenges. EVs have huge potential in India as it overcomes the challenge of high oil import and pollution.

What kind of opportunities are you eyeing in the EVs space?

Lohia Auto is currently in electric 2W and

3W and will be launching its new series of product line soon. We are looking for strategic alliances in vehicles to grow our portfolio and in key components of EV.

#### Your outlook for EVs market in India

EV in India has tremendous future. Assuming that the Indian automotive industry grows at a modest rate of 10 per cent YoY, than by 2030 total industry size will be more than 3 times of the current level. And if by 2030, EV accounts for 30 per cent of the total new vehicle sales, it will be a great achievement.

to be considered. For example, personal vehicles (2-wheelers) with low-usage – usually not more than 30-40 km per day – which includes fixed and predictable routes like commuting to office, school, etc., needs only occasional charging and can make use of home charging pods," explains Yuvraj Sarada, Senior Manager (Business Development & Strategy), Sun Mobility.

On the other hand, vehicles used for commercial purposes like delivery and bike taxis, have a daily usage of about 60-150 km with unpredictable routes and not enough time for charging. In such a scenario, he says, battery swapping will be an ideal choice as it would aid in quick replacement of battery resulting in minimal down time.

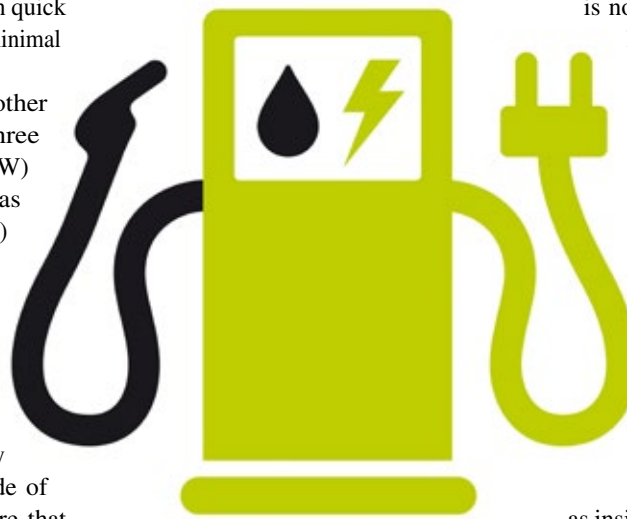
The same logic applies to other modes of transportation like three wheelers (3W), four wheelers (4W) and buses. "Applications such as personal cars, vehicles (buses, vans) used for staff transportation, fixed-route last mile connectivity etc can be powered by fast charging stations and for applications such as auto rickshaws, taxis, goods delivery and public transport buses, battery swapping technology is more ideal. Whatever the mode of charging, it is necessary to ensure that cost economics are viable for the end user," opines Yuvraj Sarada.

### **COST-EFFECTIVE CHARGING SOLUTION**

Through its smart mobility solution, Sun Mobility - whose co-founder is Chetan Maini (who pioneered the EV revolution in India by developing the country's first electric car Reva) - aims to make mass adoption of EVs a reality by offering a faster, more convenient and a cost-effective way of 'refueling' infrastructure. "The innovative approach of separating battery from the EV (at the time of purchase) and offering it on a 'pay-as-you-go' model is unique and creates a compelling value proposition to an electric vehicle user. By creating batteries to be swappable and enabling it to be swapped in a few minutes through a network of interchange stations is revolutionary technology in EV ecosystem," elaborates Yuvraj Sarada.

Sun Mobility's energy infrastructure

solution for EVs (buses, 3W and 2W) consists of smart batteries (which are standard across multiple vehicles); Quick interchange stations (which manages the batteries & its charging and enables a quick swap of these batteries); Smart network that is an IoT-based cloud platform connecting all the batteries and stations to enable seamless (interchange) service delivery; and Plug-n-Play kit that allows EV OEMs to integrate swappable batteries quickly through a standard dock (where battery is placed).



### **EVS CREATING NEW BUSINESS PROPOSITIONS**

India is at a tipping point in electric mobility. The Government of India's initial bold moves towards its target of going completely electric by 2030 has spurred the electric vehicle (EV) ecosystem. Yuvraj Sarada elaborates, "Sectors such as energy and mobility are coming together. Also, the growing shared mobility sector is a low hanging fruit that is getting a lot of attention from the government and private sector. And, as the pieces of the different segments start to unravel, exciting and new opportunities are opening up for companies and entrepreneurs in EV manufacturing, charging infrastructure, battery solutions, and energy solutions, to name a few."

The contribution of the automobile industry to the national GDP is expected to grow from over 7 percent at present to 12 per cent in the coming decade. "Over

45 per cent of the manufacturing GDP stems from the automobile industry. Coupled with a global growth rate of 60 percent in EVs, India has the opportunity to become a global player in the space and truly make a transformation," opines Yuvraj Sarada.

### **GET READY FOR GREEN MOBILITY**

EV is the buzz word today as the demand pressure on gasoline is too much. Processing and logistic of gasoline is quite high so it will be used where other energy sources cannot be used. Emphasis is on alternate energy source for vehicles which is non-polluting and can be generated

locally. "If we can increase battery life after one charge to last 200-250 km, it would be ideal situation. Additionally, recharge time needs to be brought down to 15-20 minute. High vehicle density in India would demand this," says Vikas Swami of KUKA Robotics.

Country like India needs economical commuting solution. So EV market will grow exponentially provided vehicle cost is not too high. Vikas Swami says, "EV industry would bring new vehicles on road as well as inside the manufacturing plants (shop floor logistics), airports, hospitality sector, etc. Hence, there will be growth opportunities for every industry sector related to EV manufacturing."

Environment awareness is gaining among the citizens, who are willing to join the government's initiative to address the pollution issues. Electrification is leaving its impact on many of the industrial activities and automotive sector will surely follow this trend. "Today, for example, everyone is buying only the electric fork lift which is used inside the factory. Railways is undergoing electrification and replacing diesel locomotives. This is a revolution, which is not being noticed by media and outside market. This reflects that the industry is slowly revolutionising towards green mobility! Same way the transport sector will also catch up with the change in battery technology. Green mobility is not a dream, but will soon become a reality," opines Kamath.



# “Mass adoption of EVs will need full ecosystem maturity”

Tata Motors, one of the leading players in electric vehicles (EVs) space in India, is taking a lead in zero-emission mobility by developing a range of passenger cars and commercial vehicles. The company is also working with relevant Tata companies to offer a full ecosystem solution to EV industry, says **Shailesh Chandra**, President - Electric Mobility Business and Corporate Strategy, Tata Motors. In this interview with **Rakesh Rao**, Shailesh Chandra focuses on how India can achieve its true potential in EV industry and Tata Motors' growth plans for EVs.

## How is Tata Motors preparing itself to tap the evolving EV market?

We at Tata Motors have identified sustainable transportation as one of the core elements of our company strategy, in line with the Sustainable Mobility Vision outlined by the Indian government. With Government's continued thrust on accelerated adoption of e-mobility through enabling policies and with continued reduction in battery prices and other critical components, we clearly see sharp rise in demand for electric vehicles in the coming years.

Tata Motors already has developed cars, buses and last mile vehicles – either launched already or ready for commercialisation. It has used in-house capabilities as well as collaboration with its partner, Electra EV, to develop competitive range of products. In the coming years, acknowledging the need for range of options to bring excitement among consumers, Tata Motors is developing a strong portfolio of products. Alongside products, the company is also working with relevant Tata companies such as Tata Power, Tata Motors Finance to offer a full ecosystem solution.

## What are key issues before EV industry in India?

High cost, range anxiety and charging infrastructure definitely remain the top concerns or barriers to adoption of electric cars. Nevertheless, with reducing battery costs in the future and government's support to development of charging infrastructure will overcome these top issues. Additionally, incentives through



FAME India scheme will help in overcoming the cost barrier in the interim period.

The other noteworthy issues remain the lack of choices for consumers, long charging time for electric vehicles (currently in hours, as compared to few minutes for refueling ICE vehicles) and concerns on resale value of electric vehicles. Also for the Indian market, high dependence on imports due to lack of supply base in India, pose a big constraint in a price sensitive market.

## Are there also challenges involved in the manufacturing of EVs? Is Indian auto component industry ready to support the growth of EVs market in India?

As mentioned in the earlier response, a significant value in terms of components and parts, are imported. Demand for e-vehicles is very low, which deters interest in local ecosystem development. Initial seeding order for cars (such as EESL

tender for 10,000 cars) and buses by the Government have triggered interest in not only OEMs but also other auto component players. However, clarity on EV policy, lack of sustainable demand and technology uncertainties are the reasons being stated by various suppliers for not investing.

Nevertheless, some big auto component suppliers have taken the plunge and are proactively investing in the new technology components to take the lead. As the demand in the market grows, more and more auto component suppliers, sitting on the fence, are likely to invest to secure their future as the transition gains pace. However, localisation in upwards of 80-90 per cent, is going to take time especially on account of battery cells, which is capital intensive and vulnerable to dynamic state of battery chemistry innovations.

## At present, government procurement is driving EVs market. Do you see scope for private consumption for EVs increasing as well in near future?

We believe that Government's procurement will be the anchor around which the EV ecosystem will develop. However, beyond Government, we clearly see that the fleet, commercial and aggregator segment will be the next immediate buyers because of daily running being in excess of 150 kms. This ensures a quick payback owing to lower per kilometer running cost of EVs. Private buyers will need greater awareness building and will gradually take-off. Mass adoption will need full ecosystem maturity and prices will significantly come down in future.





# “Swapping system is better solution for EV charging”

Established in 2013, Goenka Electric Motor Vehicles Pvt Ltd is the first indigenous manufacturer of electric rickshaws (3-wheeler), which are marketed under the brand name of GEM.

The company is also known for manufacturing the first ever e-rickshaw certified by the government-approved International Centre for Automotive Technology (ICAT). In this interaction with Rakesh Rao, **Zafar Equbal**, CEO, Goenka Electric Motor Vehicles Pvt Ltd, elaborates on the impact of low-cost imported technology on electric vehicle market in India.

## **How has been the journey so far for Goenka Electric Motor Vehicles Pvt Ltd? How is the demand for your e-rickshaws and other electric vehicles?**

Goenka Electric Motor Vehicles Pvt Ltd was found in 2013 by a group of intrepid engineers and highly skilled technicians to create the best possible product in terms of design and performance along with creating a cost effective solution. GEM, one of the leading government approved electric rickshaw manufacturers, provides a wide variety of high quality e-rickshaws and other electric vehicles. GEM is proud of itself to promote a cause of clean energy by creating a lasting and harmonious environment.

We serve customers from all over India. Our manufacturing base is situated in Sonapat (Haryana), where we are equipped with an excellent infrastructure that ensures production of world class products at fairly competitive prices. The plant consists of two assembly lines for e-rickshaws, production area of the chassis and FRP body. The foundation is a deep understanding of economic stimuli and customer needs. With the help of experienced engineers and technicians, the company's engineering research was able to develop a variety of products. It was Goenka Electric Motor Vehicles, which launched the first full fibreglass (FRP) vehicle in India.

Our electric vehicles are used by most of the proficient clientele who have been into the industry for a very long time and have been known for their procurement



processes. This shows that the models supplied by Goenka Electric Motor Vehicles are very much apt technically and holds a strong faith in the hearts of the customer on the basis of quality and performance.

## **What are the challenges before electric vehicle manufacturers? Are low-cost vehicles a hindrance in the growth of EV industry/**

Since electric vehicles are new to the market, the people in the industry are not much aware of the facts and the technicality of the overall vehicles system which include an entire set of technical programs within the components of the vehicles. Generally, a lot of so called manufacturers are setting up their manufacturing plants and doing a complete assembly of the vehicles. They do not undergo the R&D process and are unaware of

advancements in the technology. We cannot blame only the manufacturers for this and there is also a reason behind this practice. People, to whom these vehicles are sold, do not demand advancements in the vehicle and are very much satisfied if the vehicle runs for 80 km per day. They are also cost-conscious and opt for low-priced products.

Lower the price, higher the demand. This is the USP which disables the manufacturers to do any kind of advancements and the R&D in the vehicles. They are left with no options, but to assemble the vehicles at their workstation.

## **For charging infrastructure, there are multiple models being proposed - top among them being installation of charging stations and battery swapping. Which according to you is best suited for India?**

Charging infrastructure is very much required to be established in the country without which we cannot proceed either with the swapping system or the charging system. According to me, the swapping system is the best way to resolve each kind of issues and various developments in the technology would be required for the same.

## **What are your growth plans for the company?**

We will keep walking ahead, steadily and firmly with the vision of bringing top most technology for the development and manufacturing of electric vehicles. 