EVreporter

MAY 2022 | MAGAZINE

WHAT'S INSIDE

AsahiKASEI

XYRON™
mPPE Lightweight Material for Battery Applications

Application possibilities with XYRON™

Lightweight | Electrification | Safety / Comfort

Application Areas

- Automotive industry
  (relay block, structural parts of lithium-ion batteries)
- Energy industry
  (photovoltaic junction box, connectors)
- Other industries (water-related applications)

Properties	Unit	Method	PP/PPE	PS/PPE			
			TF701	340Z	540Z	443Z	G601Z
Specific Gravity	g/cm^3	ISO 1183	1.08	1.08	1.08	1.10	1.17
Tensile Strength	MPa	ISO 527	48	55	69	62	84
Tensile Elongation	%	ISO 527	12	14	12	14	4
Flexural Strength	MPa	ISO 178	70	90	107	96	136
Flexural Modulus	MPa	ISO 178	2300	2400	2500	2200	3700
Charpy Impact Strength (Notched)	kJ/m^2	ISO 179	5	15	19	42	10
Deflection temperature under load (DTUL)	°C	ISO 75 (1.8 MPa)	108	96	112	108	118
Flammability	-	UL 94	V0	V0	V0	V0	V0
CTI	-	UL 746A	-	PLC 3	PLC 0	PLC 0	-
RTI	°C	UL 746B	65/65/65	105/105/105	110/105/110	105/105/105	50/50/50

Properties of various XYRON™ grades

XYRON™ (modified polyphenylene ether or mPPE) is an engineering plastic with unique properties due to various possible alloy combinations of PPE with polystyrene (PS), polyamide (PA), polypropylene (PP), polyphenylene sulfide (PPS) or other polymeric materials.

XYRON™ PS/PPE features excellent dimensional stability, electrical properties and is suitable for PV junction boxes and connectors, contributing to downsizing.

XYRON™ PP/PPE has a low density and also electrolyte solvent resistance. This feature makes it suitable for lightweight automotive battery parts.

Key Properties

- Use of Halogen-free flame retardants
  (UL94 V-0 to HB)
- Outstanding heat resistance range (80 – 170° C)
- Low density
- Excellent dimensional stability
  – low mold shrinkage
- Low water absorption
- High resistance to acids and alkalis
- Excellent electrical properties

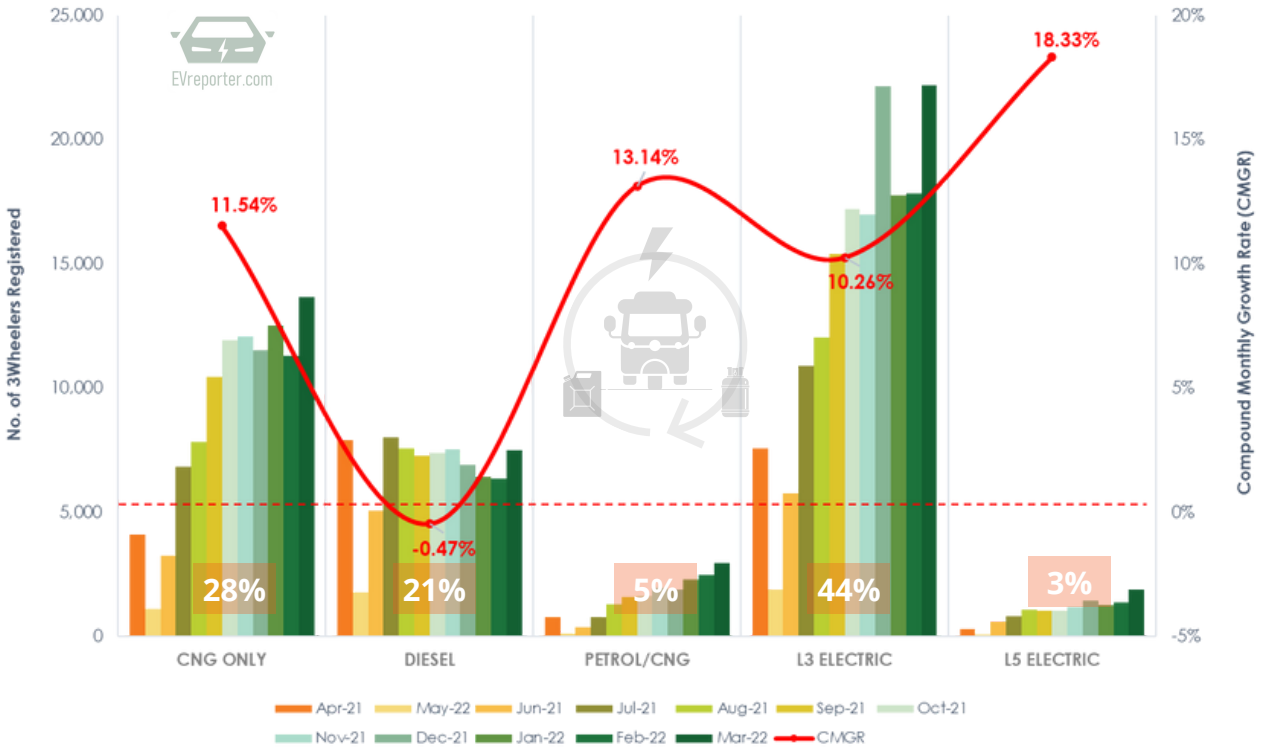
Asahi Kasei Plastics Singapore Pte Ltd
1 HarbourFront Place, #16-03, Singapore 098633

https://www.asahi-kasei.com.sg/contact-us/
Tel: +65 6324 3001
https://www.asahi-kasei.com.sg/

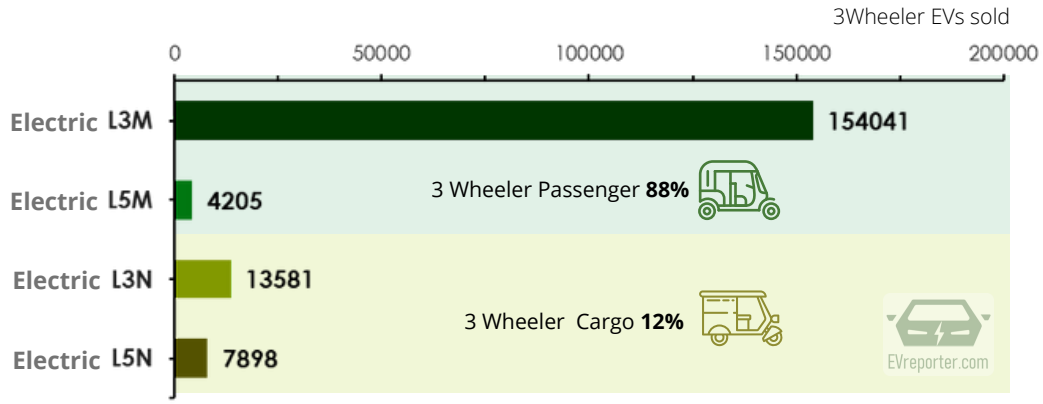
INDIA'S THREE WHEELER VEHICLE MARKET FY 2021-22

3 Wheeler sales across categories - FY 2021-22

- During FY 21-22 - **3,84,215** units of 3 Wheelers were sold in India, including Cargo and Passenger categories.
- **Electric powertrain dominates the market with 47% market share and 1,79,725 units sold during FY21-22. In FY 20-21, electric powertrain had a 39% market share.**
- CNG powertrain comes next with a 28% market share in FY21-22 (up from 15% market share in FY20-21) and compounded monthly growth rate of 11.54% over the period. Diesel powertrain obtained a market share of 21% (down from 40% market share in FY20-21), and the demand for diesel 3Ws witnessed a decrease because of strict emission norms and high fuel prices.
- Within electric powertrain (47%), the Low-speed L3 category e-3W made up 44% of total sales with a compounded monthly growth rate of 10.26%. High-speed L5 category e-3W account 3% share, but the category recorded the highest monthly growth rate of 18.33**%** during FY 21-22.



Break up of electric 3W sales - FY 2021-22



FY 21-22
1,79,725 E-3W
sold

- There are two variants in the electric 3-wheeler segment in India, Low-speed e-cart/e-rickshaw or L3N/L3M category vehicle and the High-speed L5N/L5M category vehicle. These variants differ in dimensions, carrying capacity, motor specifications and range.

- Electric 3-Wheeler sales in India are dominated by **Low speed L3M category passenger vehicles** with **1,54,041 units** sold during FY 21-22, i.e. **86% of all e3W sold during this period,** followed by L3N category cargo vehicles with 8% share of the pie.

- L5 category 3Wheeler sales are low with 4% and 2% share for the cargo and passenger segment, respectively. Still, the powertrain is gaining momentum since it is a good alternative to its gas-guzzling rivals. The growth in this segment is aided by e-commerce giants and other 3PL players, which have committed to sustainable last-mile logistics.

Top-selling electric 3W OEMs during FY 2021-22

S No	L3 OEM	FY 21-22 sales	L5 OEM	FY 21-22 sales
1	YC Electric	17,044	Mahindra Electric Mobility	3295
2	Mahindra Electric	9550	Piaggio Vehicles	3013
3	Saera Electric	8,461	Omega Seiki	815
4	Champion Poly Plast	7,523	Kinetic Green Energy	326
5	Best Way Agencies	6,220	Euler Motors	305
6	Dilli Electric	6,182	Altigreen Propulsion Labs	161
7	Unique International	5,020		
8	Thukral Electric	4,334		
9	Mini Metro	4,307		
10	Vani Electric	4,103		

- Electric 3 Wheeler sales in India account for **41%** of all EVs sold during FY 21-22 (excluding low-speed electric 2Ws).

- For FY 21-22, the L3 category 3 Wheeler sales **increased by 94%** compared to FY 20-21. L5 category recorded **5 fold jump in sales in** FY 21-22 over last FY.

- The electric 3 Wheeler market in India is highly fragmented and has approximately 300 OEMs for the L3 category and 67 OEMs for the L5 category, as seen on the Vahan portal.

- The top 10 OEM manufacturers in the L3 category contribute only **43%** of the total sales, whereas the top 6 OEMs in the L5 category contribute **78%** market share.

Source: *Vahan Dashboard. Data as per 1429 out of 1613 RTOs across 33 out of 37 state/UTs and Telangana Regional Transport portal. Data used for analysis is a cumulative sum of statistics from the Vahan portal and Telangana Transport portal. Petrol, LPG and Petrol/LPG powertrain for 3Wheelers are not included in the analysis.*

Battery maker Exide Industries will invest INR 6,000 crore in Karnataka to set up a lithium-ion cell manufacturing plant. Exide has requested 80 acres of land in the Haraluru Industrial Area near Bengaluru airport for this facility. Earlier in March 2022, Exide entered into a long-term technical collaboration agreement with SVOLT Energy Technology (China), receiving the license to commercialise the latter's technology for lithium-ion cell manufacturing in India.

California–based **Biliti Electric** announced that it intends to set up an **electric three-wheeler factory in Telangana**, with a production capacity of 240,000 EVs per year. The new plant is estimated to drive private investment of USD 150 million.

The facilities will be built in two phases over an area of 200 acres. Phase I will be developed over 13.5 acres with the capability to produce 18,000 vehicles per year and is expected to be operational in early 2023. The larger facility spread across 200 acres will be operational in 2024. Biliti currently operates through an exclusive manufacturing partnership with Hyderabad-based Gayam Motor Works (GMW). Luxembourg-based GEM Global Yield LLC has committed $400 million to Biliti in the form of a Share Subscription Facility.

Omega Seiki Mobility announced its plans to set up an **electric three-wheeler manufacturing facility in Karnataka, with an investment of USD 250 million.** The company says the new facility will be built in three phases and will have a production capacity of a million electric three-wheelers per annum when completed. **The company will be raising funding in the form of equity as well as debt to build the plant, which is slated to begin production by FY24.**

Triton EV has acquired AMW Motors Manufacturing Facility of 3.7 Million Square Feet in Bhuj, Gujarat.

Triton EV has signed an MoU with the Gujarat Government to set up an **EV Truck Manufacturing Hub** with a minimum investment commitment of INR 10,800 Crores over 5 years.

According to a Times of India report (based on a copy of Gujarat government note), **Tata Motors is close to acquiring the passenger car manufacturing facility of Ford India at Sanand for an undisclosed amount and intends to invest INR 2,000 crore to manufacture 2,00,000 electric vehicles per annum by 2026 at the facility.**

Electric 2W start-up **Simple Energy** signed an MoU with **C4V**, a lithium-ion battery technology company, to set up lithium-ion cell manufacturing ecosystem in India.

Tata Passenger Electric Mobility (TPEM) unveiled AVINYA EV Concept, based on its Pure EV GEN 3 architecture. The concept introduces a new typology that combines a premium hatch with the versatility of an SUV and the roominess and functionality of an MPV. The first EV based on this concept will be introduced by 2025.

Earlier in April 2022, Tata Motors showcased its Gen 2 Electric SUV Concept – CURVV which is expected to launch in the next two years as an EV, followed by its ICE counterpart.

Tata Motors announced a partnership with **Lithium Urban Technologies,** an EV based urban transportation service provider, which will deploy **5000 XPRES T Electric Sedans** across the country for employee transportation. Tata Motors will commence deliveries in phases and complete the deployment by next year.

In July 21, Tata Motors launched the 'XPRES' brand exclusively for fleet customers. XPRES-T EV is the first vehicle under this brand. It comes with two range options – 213 km and 165 km.

Kia India will bring The Kia EV6 to India. Bookings open from May 26, 2022.

The EV will be imported as a CBU, and a limited number of units will be available initially.

More details about the specifications of the model are awaited.

Hyundai Motor India will introduce IONIQ 5 EV in India in the second half of 2022. This CUV is built on Hyundai Motor Group's Electric-Global Modular Platform (E-GMP).

IONIQ 5 won the World Car of the Year (WCOTY) at the 2022 World Car Awards.

emf™
INNOVATIONS

RELIABLE AND COST-EFFECTIVE ELECTRIC MOTORS

EMF Innovations Pvt Ltd (EMFi) is a technology provider specialising in the design and manufacture of electric motors & controllers for green mobility and other applications based on customers' technical specifications. EMFi is headquartered in Singapore with substantial R&D and manufacturing operations in India.

Our Products

ELECTRIC MOTORS

We design and produce BLDC Hub and Inner Rotor Motors, Switched Reluctance Motors (SRMs) and Permanent Magnet Synchronous Motors (PMSMs) for 2-wheelers, 3-wheelers, and various other applications.

Our motors come in various sizes, output powers, and IP ratings. They come in rim-mounted and spoke-mounted models.

We also customise our motors according to your needs. We have designed motors for applications such as boats and heavy vehicles.

MOTOR CONTROLLERS

Electric motors must be paired with the best controllers. We design custom controllers for electric motors which optimise their performance. Our locally produced controllers outperform imported, off-the-shelf controllers.

Our Manufacturing Address
Manufacturing Site 2/209, Rajiv Gandhi Nagar, Mylampatti Village, Neelambur, Coimbatore—641062

CONTACT US
Call us at
+91 77085 84111
or email us at
sales@emf-i.com


BRIGHTBLU
EV CHARGING
MADE EASY.
For more information
check BrightBlu.com

E-2W BATTERIES ARE CATCHING FIRE | INDUSTRY PRACTICES NEED CORRECTION

After the recent fire incidents with leading electric 2W companies in India, one is left wondering why are these Lithium-ion batteries catching fire? Lithium-ion batteries are classified under the dangerous goods category.

In this article, **Rahul Bollini** explains the multiple reasons an EV battery pack can catch fire and a **few tips for the nascent Indian EV industry to get the battery safety issues under control.**

A Lithium-ion battery pack comprises of multiple cells in a series and parallel arrangement to achieve the required voltage and capacity. ***A Li-ion cell catching fire is termed a thermal runaway in technical terms.*** *Thermal runaway is caused by a chemical reaction that has a ripple effect inside the cell and results in fire. It is the nature of Li-ion cell chemistries such as NMC and NCA. This reaction is very difficult to stop once it has begun. It begins when the cell reaches high temperatures leading to an internal chemical reaction, which further increases the heat generation and the next thing we know, smoke and fire are coming from the cell.* ***The chemical reaction leads to all of the cell's energy being released at the same time.*** *All of this happens in a very short period of time.*

The reasons that lead to thermal runaway are discussed below.

Internal short circuit of a Lithium-ion cell due to physical damage

Physical damage can lead to an alteration in the internal structure of the cell. When the structure changes internally, the cell can no longer be expected to perform normally, and it is a matter of time before the cell will short circuit. External mechanical vibrations could also cause physical damage.

Improper heat management

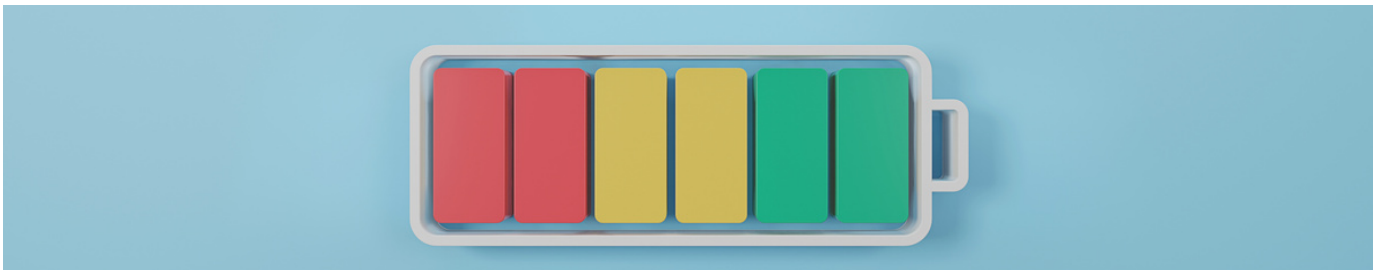
No batteries are perfect when it comes to charge-discharge efficiency. Efficiency losses are more during fast charging and high-power discharge. The energy loss is in the form of heat. This heat needs to be carefully managed and the cells should not be exposed to heat for too long. Long term effects of exposing the cells regularly to high temperatures include faster degradation of the cell's capacity. If exposed to higher temperatures, the cells should not charge/discharge anymore and it is the duty of the BMS to cut off the battery operation.

BMS failing to cut off the battery at this instance can quickly accelerate thermal runaway of the cells. BTMS (battery thermal management system) is a good way to tackle this. However, **most electric 2Ws on roads have no thermal management and hence electric 2W are seeing a number of fire incidents compared to other vehicle segments. The cells in these battery packs are very tightly packed leaving no breathing space.** BTMS is an emerging field and needs more R&D focus.

Overcharging

Charging the battery beyond its limit can rapidly elevate a chain reaction inside the cell. It is the duty of the BMS to perform functions such as overcharge protection, under-voltage protection, continuous current, over-current detection and over-temperature protection. The battery companies must use reliable BMS that doesn't fail on the field.

Most low-cost BMS come with one year warranty, and they fail after the warranty period. **Some BMS also fail due to their inability to handle regenerative energy coming back from the electric motor. This is very common in electric 2Ws using universal controllers that have the ability to handle 48V and 60V.** The reverse energy is unregulated and slowly damages the BMS over time.



Overusing the battery after its EoL (End-of-Life)

Lithium-ion cells come in two grades - **EV (electric vehicle) grade and ESS (energy storage system) grade.** EV grade cells are called power cells; ESS grade cells are called energy cells.

EV grade cells have lower internal resistance, allow for fast charging and have higher maximum continuous discharge capability. These cells have a shorter life and a lower cycle life. On the other hand, ESS grade cells have higher internal resistance, do not allow for fast charging and have lower maximum continuous discharge capability. These have excellent cycling performance with high cycle life.

EV grade cells are expensive, and the way they are designed internally is different from ESS grade cells. An EV grade cell loses the capability to behave like one after it has cycled for a given number of cycles. **At this point, the cells have developed higher internal resistance, and they become unfit to be used for an EV application.** The battery should no longer be deployed for an EV application. For example, Tesla says its battery needs to be replaced when degraded to 70% of its original capacity. Some companies set this limit to 80%. **This terminology is called as end-of-life of the battery in the EV application.** The vehicles must have inbuilt systems tracking the battery's health and notify the user when the battery has become unfit to work in an EV, e.g. how Apple sends out a notification to iPhone users to replace the battery when the battery health has hit 80%.

If a battery is used in the EV application beyond its end-of-life, the higher internal resistance will generate a high amount of energy losses in the form of heat during charging and high-power discharge. In this case, the battery constantly experiences high amounts of heat, and it can lead to constant battery cut-offs from the BMS due to the over-temperature cut-off function. Constant cut-offs can lead to longer charging times and **the vehicle turning off constantly during driving**. In a rare scenario, it can also lead to thermal runaway.

Using lower grade cells in EV application

EV applications need A grade EV cells. Many battery packers are using B grade cells for EV applications, which can at the most be used in small ESS applications. I wouldn't suggest them even for higher capacity ESS applications. **B grade cells seem to perform similar to A grade cells during initial charge-discharge cycling; however, they are not going to perform uniformly after ageing a few hundred cycles** - this is when they create balancing issues. B grade cells also tend to have a sharper rise in internal resistance with ageing. **Balancing issues and the sharp rise in the internal resistance** can lead to lower output overall and generate heat due to some cells heating up.

A common scenario with B grade cells is when one NMC cell in the pack hits the upper cut-off voltage of 4.2V and the rest of the cells are not fully charged, and the battery pack stops charging. A similar scenario during discharging is when one cell hits the lower cut-off voltage faster than the others, and it leads to the cutting off of the battery pack energy supply. B grade cells have a lot of variations in their performance since there is no fixed way of determining why a cell has been classified as B grade.

As per my professional experience, **grading of Lithium-ion cells** is done on the basis of:

- Self-discharge in terms of millivolt/day
- Internal resistance at a particular SoC (state of charge)
- Nominal voltage and voltage range
- Capacity of the cell
- Cosmetic defects

Some mass manufacturing companies have up to 9 varieties of B grade cells starting from B1 up to B9, while some simply grade them as A, A-minus and B. Just think of the combinations of cells that fit in these categories and imagine them working with each other. It cannot get any more non-uniform than this.

Another kind of B grade cells are **refurbished cells**. These cells previously had higher capacity in terms of mAh and now they have reached their end of life. **These are dismantled from the battery pack and sold as a new lower capacity cell with a new PVC cover**. These cells are definitely not fit for EV applications, and it is hard to figure out where the received cells are refurbished since they are imported from outside.

In a nutshell, we can avoid thermal runaway and battery fires through the following measures:

- Avoid physical damage to the battery.
- Explore basic BTMS options, and let's not forget that India’s climate is hotter than other countries seeing high rates of EV adoption.
- Use a good and reliable BMS that has branded MOSFETs and ICs.
- Validate the BMS well before deploying it in a large number of battery packs.
- Recall the EV battery packs at the end-of-life period.
- Use A grade cells for EV applications.

About the author

Rahul Bollini is an independent R&D consultant in the field of Lithium-ion cells and batteries with 7 years of industry experience. The author can be reached at bollinienergy@gmail.com or +91 72049 57389.

EVreporter.com

Product Feature

NEW SILICONE FOAM FOR ELECTRONICS AND EV BATTERY PACKS

CHT
SMART CHEMISTRY WITH CHARACTER.

The CHT Group has recently introduced a new silicone foam during IPC APEX Expo, which took place on January 25-27th in San Diego, CA.

CHT's SilSo Lite 21025 is a two-part, room temperature platinum cure, self-blowing silicone foam which creates a closed-cell structure.

- CHT's SilSo Lite 21025 is designed to reduce weight – as well as **mitigate thermal runaway and provide protection from moisture, debris, vibration and shock for electronic components and EV battery packs.**
- This silicone foam is also ideal where low smoke, flame and toxicity are required.
- The SilSo Lite 21025 is designed as a liquid system with a 1:1 mix ratio and low viscosity, enabling easy dispensing either by cartridge or automated mixing machine. This silicone foam's fast gel time will help increase production throughput and it features primerless adhesion to a variety of substrates.
- Additionally, improved adhesion can be achieved by using one of CHT's recommended primers. SilSo Lite 21025 will expand 2-3 times its liquid volume and will reach full cure in about 10 minutes.

Addressing safety requirements, **SilSo Lite 21025 exhibits excellent flame retardancy which will help mitigate a thermal runaway event**. Independent testing is in progress to certify that SilSo Lite 21025 meets the UL 94 V-0 rating. To date, CHT's SilSo Lite 21025 is currently running in dispensing trials with various equipment companies located in the US and Europe.

"*The new, high-performance lightweight silicone materials being developed by CHT will help drive innovation across many markets and applications that utilize these materials*," stated **Phil McDermott, Chief Technology Officer at CHT USA**. "*These materials are designed to meet challenging performance criteria while keeping sustainability as a key design factor*."

To learn more about CHT's SilSo Lite 21025, please visit www.cht-silicones.com or email at material@cht.com.

About the CHT Group

The CHT Group is a global player for speciality chemicals, and is active worldwide in development, production and sales. CHT Germany GmbH in Tübingen is the headquarters of the group of companies which focuses on sustainable chemical products and process solutions.

CHT
SMART CHEMISTRY WITH CHARACTER.

TEXTILE SOLUTIONS of CHT improve the quality, functionality as well as look and purity of textiles and optimise their manufacturing processes.

In the fields of silicones, building materials, paints, coatings, paper, agrochemicals as well as cleaning and care products innovative products and process solutions are provided by INDUSTRY SOLUTIONS.

By combining the strengths of the complete group further innovative products, applications or processes are continually developed and vast technical support is offered within the SCIENCE & SERVICE SOLUTIONS. Highly qualified specialists work in state-of-the art laboratories for development, analytics and application technique in order to work out ideas and solutions that meet the latest requirements.

The CHT Group with its own production and sales locations is represented by 26 companies worldwide. In the financial year 2021, the CHT Group generated a group turnover of 630 million Euros with around 2,400 employees. ***For more information, please visit us at www.cht.com***.

CHT INDIA can be reached at -

Bhushan Konge | +91 73044 89220 | bhushan.konge@cht.com

NITI Aayog has released the draft of the awaited EV Battery Swapping Policy. The policy aims to establish the principles to enable the interoperability of components within a battery swapping ecosystem. Stakeholder consultation is in progress to finalise the policy. Some key takeaways from the draft:

- The policy will be applicable to Advanced Chemistry Cell batteries only.
- All Battery Swapping Stations should serve at least two EV OEMs.
- Unique Identification Number (UIN) to be assigned to the batteries at the manufacturing stage for tracking and monitoring during their lifetime.
- Vehicles sold without batteries can be registered based on the Type approval certificate, without the need to specify any details of the battery.
- Demand-side incentives for EV purchases can be made available to EVs with swappable batteries. Subsidies may be linked to the UIN of EVs and batteries to ensure no double-dipping.
- An appropriate multiplier may be applied to the subsidy allocated to Battery Providers to account for the float battery requirements for battery swapping stations.
- The tax GST rates on Lithium-ion batteries and EVSE are 18% and 5%, respectively. The GST Council may consider reducing the differential across the two tax rates.

Mahindra Electric Mobility said that it closed the FY22 with a market share of 73.4% and a 214% growth from FY21. A company statement further added that Treo auto was the top-selling electric 3-wheeler in the passenger category with a market share of 70.4%. The Treo Zor led the cargo segment with a 52.1% market share during FY21-22.

Tarun Mehta, CEO at Ather Energy, shared the following results from FY22:

- Revenue increased 6 times y-o-y basis
- New orders up by 7 times (annual run rate of $200M)
- Number of centres increased from 10 to 35
- The second manufacturing plant went live, and its team grew to 1500 people.

Bounce started the deliveries of its swappable battery Infinity E1 electric scooters in Bangalore and Hyderabad.

Deliveries in Mumbai, Delhi, Pune and Ahmedabad are expected to start from May 10, shared CEO Vivekananda Hallekere shared on Twitter.

According to reports, **Hero Electric is hit by chip shortages and could not make any dispatches to its dealers in the month of April 2022**. The company had been the top seller in high speed electric 2W categories for months at a stretch, and in April 2022, it saw a dip of 50% in new vehicle registrations over Mar 2022, securing the third position in high-speed e2W sales. Ola Electric and Okinawa Autotech took the first and second spots, respectively.

Gurugram based automotive component supplier **Sona Comstar has formed a strategic partnership with Canada based technology company Enedym Inc** that develops Switched Reluctance Motors and electric powertrains. The parties will develop the **permanent magnet free** SRM drive platforms for Indian road and usage conditions **targeting electric 3Ws** (10-30 kW peak power), **high-performance 2Ws** (10-20kW peak power) and 4W cargo delivery vehicles (20-40kW peak power). The serial production of these items is expected to start in 2023.

Napino Auto & Electronics has entered into a licensing agreement with Israel-based EVR Motors to develop and manufacture their patented Trapezoidal Stator - Radial Flux Permanent Magnet **motors for India's e-2W market**. According to EVR Motors, the motor is less than half the size of conventional motors and significantly lighter than conventional Radial Flux Permanent Magnet motors with similar power output. In Feb 2022, EVR Motors had announced a strategic partnership with Omega Seiki Mobility.

Hero Electric has partnered with EV Charging Network, **BOLT** to set up 50,000 EV charging stations in India in the next one year. As a part of the tie-up, BOLT chargers will be installed in more than 750 Hero Electric touchpoints across India. Around 2,000 Hero Electric riders will avail free of cost BOLT charging units set up at their homes.

MG Motor India has partnered with Bharat Petroleum Corporation Limited (**BPCL**) to bolster the **EV charging** infrastructure. BPCL said that it is setting up fast-charging corridors across major highways in India and will have a network of 7000 fast-charging stations in the next 2-3 years. Earlier in March 2022, MG Motor India had announced a new venture, MG Charge that would aim to install 1,000 AC type 2 chargers in residential areas across India in 1,000 days.

EVET - the electric mobility vertical of **Magenta**, has entered into partnerships with companies in the food industry – Elior India, SPRINK Kinematic FoodTech, Kadambass hospitality, and Foodieverse, to use its fleet for food delivery, **debuting in the mid-mile delivery segment**. The partnership, starting with Bengaluru, will be expanded to other cities. EVET runs a fleet of over 400 electric vehicles throughout many cities, including Bengaluru, Mumbai & Hyderabad.

Marriott International has commissioned Vadodara based CHARGE+ZONE to deploy charging stations across all its properties in India. CHARGE+ZONE said that it will complete the installation of 100+ EV chargers by December 2022. These charging stations will be open to the public as well as to users of Marriott's electric car fleet. CHARGE+ZONE also announced collaborating with Bharat Electronics Limited and Hindustan Petroleum to expand the public EV charging network.

Terra Motors has entered into a strategic partnership with **Sun Mobility** to integrate its 3W passenger vehicles and 2Ws with SUN Mobility's swappable battery-based energy solution.

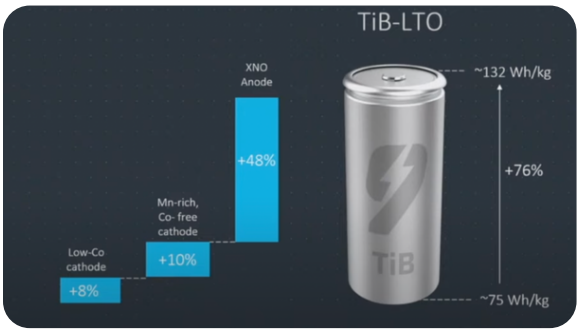
Dabur India announced that it will induct a fleet of 100 Electric Vehicles into its Supply Chain for last-mile product distribution across the nation in the next 12 months. The company has already started using EVs for product deliveries in Haryana's Sonepat area.

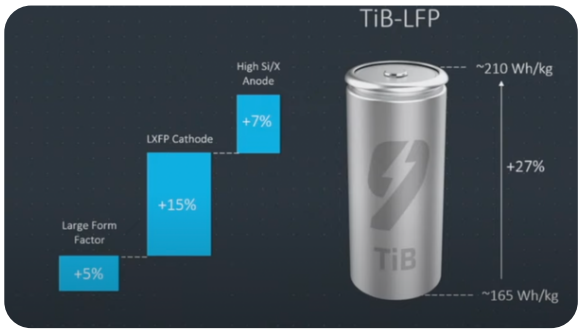
LOG9 MATERIALS TO MANUFACTURE LTO AND LFP CELLS IN INDIA

On 21 April 2022, Log9 Materials unveiled an indigenously developed cell manufacturing facility at its campus in Jakkuru, Bengaluru. Team EVreporter interacted with Dr Akshay Singhal, CEO - Log9 Materials, to discuss their cell manufacturing plans.

Log9 has been dabbling in multiple energy storage technologies since its inception. Which cell technology are you planning to roll out first, and when?

Log9 has been developing cell technologies grounds up ranging from Aluminum Fuel Cells to Ultracapacitors to **High Power Lithium-ion cells which were announced on the 21st of April under the TiB brand name.** TiB cell technology encompasses **LTO and LFP cell technology** designed for tropical climatic conditions. **Under the TiB brand, Log9 will be commercialising indigenously developed and manufactured Lithium-ion cells in the Indian market within FY 23.**





We are concentrating on the **cylindrical form factor** and **tabless cell design**. We aim to improve the energy density of LTO cells by 76% and LFP cells by 27% as compared to the cells available today.

At the same time, by concentrating on the right cell format, cell design and processing techniques, we intend to bring a more than a 60% reduction in the cost of an LTO cell and about 35% reduction in the cost of an LFP cell.

For your cell manufacturing line, what is the current production capacity per day (number. of cells)?

The **existing one is a small R&D facility** for technology development on which the first Indian commercially viable lithium-ion cell technology has been developed.

On our Day Zero (21 April), **we announced the largest cell fabrication facility in India and South East Asia, which will be commissioned by Sep 2022 with a 50 MWh peak annual capacity.**

What timeline have you set for mass manufacturing, and what scale of production are you targeting at full capacity?

We are sure that India would have a couple of hundred GWh of cell requirement locally by 2030. We **expect to have about 5 GWh of production with our cell technology by FY 26 and scale it to over 40 GWh by 2030.**

Tell us about your R&D efforts. How big is your R&D team, and what mix of skill sets do they have?

Log9 is a deep tech company with over 30% of its manpower directly engaged in R&D, apart from another 10% of team members providing direct support to our R&D efforts. Log9's R&D efforts span **material science, cell fabrication, electrode chemistry design, process chemistry, graphene scaleup, power electronics, and battery design among others.**

Are you planning to use these cells for captive consumption (making your battery packs) or do you plan to sell your cells to the market as well?

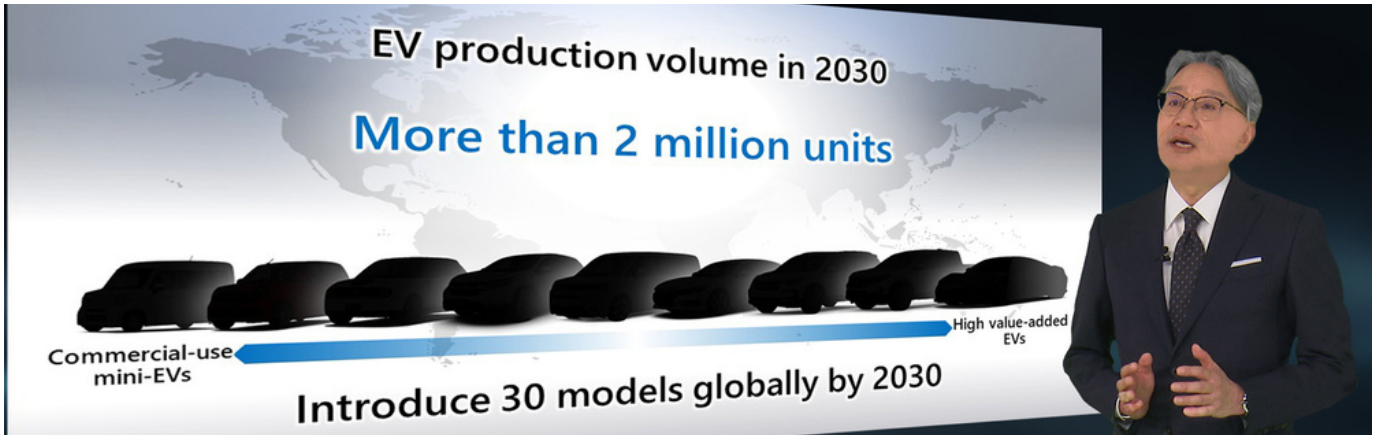
Log9 TiB cells are being built for **the captive consumption**. Log9 has developed advanced electronics for its RapidX batteries that harnesses the full potential of TiB cell and allow for fast charge technology and unleashing the full potential of TiB cells.

What is the target price per kWh you are trying to achieve for different battery/cell technologies you are working on?

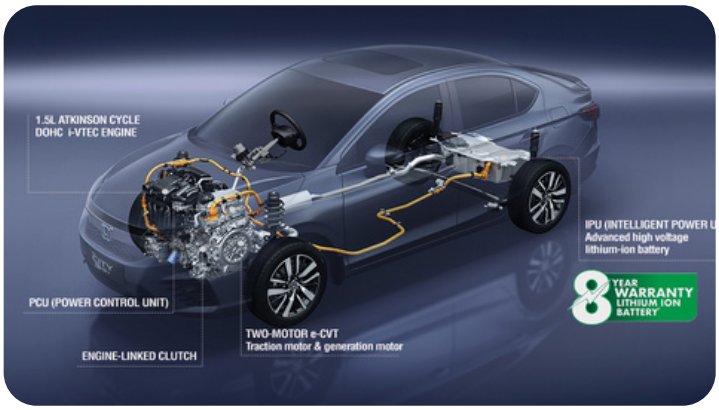
Globally competitive.

Many leading names in the Indian EV space have associated with you for fast charging RapidX batteries. How many such vehicles are already deployed in different segments?

We have around 800+ vehicles deployed as a mix of 3W, 2W and 4W in the market, with 20-25 vehicles separately in various segments as pilot for new upcoming platforms.



Honda will allocate approximately 5 trillion yen in the area of electrification and software technologies in the next 10 years. Their overall R&D expenses budgeted for this period will be approximately 8 trillion yen. **The company plans to launch 30 EV models globally by 2030, with a production volume of more than 2 million units annually.** Additionally, Honda announced that it will build a demonstration line to produce **all-solid-state batteries** with an investment of approximately 43 billion yen and further accelerate the research with a goal to start demonstration production in Spring 2024.



Honda Cars India launched the strong hybrid version of the City on April 14, 2022. Honda City e:HEV offers three driving modes: EV Drive, Hybrid Drive and Engine Drive.

The car will be manufactured at Honda's facility in Tapukara, Rajasthan.

TVS Motor Company has acquired a majority stake in the British e-bike supplier EBCO Ltd in a deal worth £1.16 million (€1.39 million). This is the third investment made by TVS Motor in the European e-personal mobility space. The company had recently made investments in Swiss e-Mobility Group (SEMG) and EGO Movement.

Fire incidents and product recall - After the recent fire incidents with electric 2Ws, PURE EV has decided to recall 2,000 electric scooters of concerning batches. Okinawa Autotech announced the recall of 3,215 units of its Praise Pro e-scooters following multiple fire incidents, while OLA electric recalled 1,441 units of its EVs for performing necessary checks. The government has formed a committee of experts from the Centre for Fire, Explosive and Environment Safety (CFEES) - DRDO, Naval Science & Technological Laboratory (NSTL) - DRDO and IISc Bangalore to look into the recent cases.

Bengaluru based Chara Technologies is **developing a rare-earth free 2-wheeler Hub Motor for Bounce**. The motor and controller are designed and manufactured locally, the CEO Bhaktha Keshavachar said on LinkedIn. The company has started the road-testing of these motors.

IIT-Madras incubated electric vehicles sub-component manufacturing start-up **Revoh Innovations has raised USD 131,000 as seed fund**. The start-up plans to up a manufacturing unit in SIPCOT, Chennai, with the help of seed money. The R&D division will continue to function from IIT Madras Research Park (IITMRP).

BGauss Electric Scooters raised INR 52 Crores in a funding round led by Darshan Bhai Patel of Vini Cosmetics. Started in Oct 2020, BGauss is looking to launch two new products in 2022, and it is the first fund-raise by the company. Its parent is 800 Million USD RR Global Group.

Delhi based Baaz Bikes raised $2 million in Pre-Series A led by Kalaari Capital and with participation from existing investors and others. According to its website, the start-up is building an EV Platform for Gig Workers, developing a full-Stack solution including use-case specific electric 2Ws and swapping stations.

EV-based last-mile delivery start-up **Zypp Electric raised $1 million in debt funding from Northern Arc**. In Sep 2021, the start-up had raised its USD 7 million Series A round co-led by 9Unicorns and Anthill Venture. According to CrunchBase, Zypp Electric has raised a total of $11.6M in funding over 9 rounds to date.

Battery Swapping solutions company **Chargeup** and **Microgrid Labs** have formalized a business engagement with **BECIL** to be their technology partners. BECIL is a Mini Ratna Public Sector Enterprise of the Government of India, offering advisory services to the Indian and Overseas customers to support the transition from fossil fuel-powered fleet to electric fleet. The objective of this MoU is to prepare a framework and cover transition planning and design for fleet electrification and EV charging infrastructure market using Battery Swapping Technology.

American automaker **Fisker Inc has selected Hyderabad as headquarters for its operations in India.** Fisker Vigyan India will focus on software development and embedded electronics, virtual vehicle development support functions, data analytics, and machine learning. The Minister for IT and Industries, K.T. Rama Rao, recently visited Fisker's Manhattan Beach, California HQ.

TATA Motors emerged as the lowest bidder across all categories for the CESL tender of 5450 e-buses worth over INR 5,000 crores. The lowest price of 12m low floor AC buses is quoted at INR 47.49 Rs per km, 12m low floor Non-AC at INR 43.49 per km, 12m standard floor Non- AC at INR 44.99 per km, 9m standard floor AC at INR 41.45 per km and 9m standard floor Non-AC at INR 39.21 per km. This includes the cost of electricity for charging the buses.

EV charging solution provider **Statiq** announced a collaboration with **Hindustan Petroleum Corporation Limited** to set up more than 200 charging stations across the highways of Uttar Pradesh, Bihar and Uttarakhand. Statiq also partnered with **Ather Energy** to enhance the combined charging network in North India.

Established in 1982, Poggenamp Nagarsheth Powertronics Pvt. Ltd. offers a wide range of custom-made stampings/laminations for e-mobility

Laminations for all rotating e-mobility applications	Self-bonded, Welded, Riveted and Cleated Stators	Self-bonded, Riveted and Die Cast Rotors
Laser Cutting with Stacking for Prototypes	Development of Punching Tools	Machining of Stators and Rotors
Stator Winding with Rotor Shaft Insertion	Copper Coils	End laminations

Focused on processing superior grades in thickness 0.20 / 0.25 / 0.30 / 0.35 / 0.50 mm
Prime Electrical steel is sourced directly from reputed Steel Mills

Modern testing and inspection facilities incorporates epstein test frame, franklin tester, rotor analyzer, stator core tester, optical cmm and more.

Capacity to punch 2000 mt/month of finished laminations.

Not Just **Laminations** - Total **Solutions**

POGGENAMP®

POGGENAMP NAGARSHETH POWERTRONICS PVT. LTD.

An ISO 9001:2015 and IATF 16949 certified company.

207, 2nd Floor, Mauryansh Elanza, Shyamal Cross Road, Satellite, Ahmedabad - 380 015, Gujarat, India

+91 9925100520, +91 79 6163908

info@poggenamp.com

www.poggenamp.com

Ador Digatron

QUENCH

An innovative & world-class DC Fast Charger, designed to charge electric cars and buses to global standards. Proudly made in India, the Quench™ has an intuitive interface making charging your EVs simpler than ever imagined before.

- DC 60kW / 120kW / 240 kW
- Available in CCS2 & CHAdeMO
- AC 22kW : Type2
- OCPP Compliant

Contact Us :-
+91 7758929541 asharma@adordigatron.com

quenchchargers.com

ELECTRIC TECHNOLOGIES AND ALTERNATE FUELS - ALL HAVE A ROLE IN INDIA'S MOBILITY FUTURE - TOYOTA KIRLOSKAR

Team EVreporter had an interaction with **Mr Vikram Gulati, Executive Vice President of Toyota Kirloskar Motor (TKM)**. The focus of this discussion is India's electrification journey, especially in the personal vehicle segment and the part TKM aims to play in this journey.

Could you tell us more about the pilot that Toyota Kirloskar and ICAT are running to evaluate Toyota Mirai for India's driving conditions?

As a part of our constant endeavour to evaluate all possible technologies that can help us move towards a more sustainable and cleaner future, we've undertaken this activity with ICAT to evaluate **how this hydrogen-powered vehicle works in Indian conditions**. We are very confident that it will be well suited as Mirai has already been commercially sold in many countries with varying extreme temperature conditions.

But there is no current infrastructure for fuelling a hydrogen run vehicle. Who will be the target buyers for this vehicle?

To understand why we're introducing this vehicle for testing, you have to basically look at the Toyota philosophy. Our philosophy is to work for a sustainable future. In 2015, Toyota globally took an environmental challenge to achieve a net-zero carbon footprint by 2050 well before anybody was talking about net-zero. It's not just about vehicles; it's about creating a hydrogen society which is truly renewable. You can link renewable energy to generate green hydrogen. And this green hydrogen can be used not only for transportation but also for difficult to decarbonize sectors, such as steel, cement and fertilizers.

The fuel cell stack that sits in the Mirai can be used for storing electricity generated from renewable energy. The same stack can be used in a train or a ship or a truck, and many of these applications are already live. The same stack is also going to be provided to a space agency in Japan for use in a lunar module. So, it's really about our bit to try and create a society that is more in harmony with nature.

Coming back to mobility applications, can you share what are Toyota Kirloskar's plans to introduce electric vehicles in India? Are you going to focus on plug-in hybrids first, or do you have plans to launch a BEV soon?

We were amongst the first companies to launch an electric vehicle globally. It was way back in the mid-1990s, along with GM. At that time, EVs faced much stiffer challenges. Hence, hybrid technology was invented, followed by a host of technologies like plug-in hybrid and subsequently the Mirai. All these technologies are very similarly placed, and we consider strong hybrid as the mother technology. The electric powertrain is common across all these technologies. The difference is that you are increasing the quantum of the components like batteries or motors, depending on how you balance the energy.

Coming back to your question about when we are going to launch BEVs, we have all the technologies globally, and we are in a position to introduce any of these. From a technology standpoint, it's not an issue.

What we really look at is the basic reason why the shift is happening, which is to speed up the shift away from fossil fuel-based transportation and reduce carbon emissions. If you look at these objectives, there are two key factors to consider:

- **What is the local energy mix?**
- **What technology can the consumer accept in the least painful manner and how developed the supporting ecosystem is?**

Let's say a certain technology mix may be relevant in a country like Norway, which has a high per capita income. Energy is predominantly renewable as they generate huge amounts of hydroelectricity, and the entire infrastructure is set up for supporting a pure BEV ecosystem.

But when you consider countries that are still predominantly coal-based, have a more price-sensitive consumer base and a supporting ecosystem underworks, we believe that a host of technologies need to be propagated, including battery-electric, strong hybrid and in future, hydrogen vehicles.

Particularly for the Indian market, what is the right way to transition from fossil fuel to EVs? In your opinion, which technologies will find more acceptance?

The consumer is the most critical stakeholder, and their acceptance is most important. If you look at three-wheelers, it's definitely much easier to electrify and BEV becomes the technology to go to. But if you look at the larger formats, dynamics are much more complex. The key is to use all technology formats, which enable us to reduce fossil fuel consumption. And with the evolution of the ecosystem, the mix of the prevalent technologies would evolve as well. **But at the moment, we strongly believe that not only the full family of electric powertrain technology but also alternate fuels such as ethanol and CNG have a role to play.**

Do you feel that we are not ready to accept battery electric vehicles at this point and more preparation is needed at the ecosystem level to get people to opt for fully electric vehicles?

I wouldn't put it in such a negative connotation. As you move along the timeline, the context will change, and the ecosystem will develop. The real issue right now is that we can't wait for the ecosystem to come up, we can't wait for prices to go down to a level where consumer acceptance in terms of upfront Capex is not an issue anymore.

So, what we have to do right away is focus on whatever helps us achieve our national objectives. Even with the aspirational goal of 30% EV penetration by 2030, which many people are questioning, 70% will be non-BEV, especially in the four-wheeler segment. **Do we want that 70% to be just gasoline and diesel, or do we want it to be technologies like strong hybrid, which would reduce fossil fuel consumption by 50%, and cleaner than gasoline/diesel technologies like flexi fueled vehicles or CNG etc.?**

What learnings have you drawn from your experience of selling xEVs and Mirai in other markets that you are looking to apply when you electrify your Indian offerings?

1. The first learning is that all of these technologies are complementary. They have their strengths, weaknesses and areas of maximum utility. A BEV is practicable for short intracity distances with small loads. **For larger format vehicles with very high payloads and longer-range requirements, technologies like plug-in hybrids or hydrogen become more practical. It's going to be a multi-technology future.**

2. Second, we have to leverage the complementary nature of these technologies.

Today if we shift to electric vehicles by importing the key components and just assemble and sell in India, it is not going to be sustainable. **In order to Make in India and with higher value capture, you need significantly higher demand than today to get viability around investments.** And one way to do that is to accumulate the demand from all of these technologies. **Assimilation of demand across all technologies can help Toyota create an ecosystem of local manufacturing much faster**. That's the approach everybody took, including China, the Europeans, and Southeast Asian countries. You must proportionately support all of these technologies so they become much more attractive than traditional ICE technologies.

What can we expect next in terms of eMobility offerings from Toyota Kirloskar?

I can't go into the specifics of either a product or the technology mix. Our aspiration is to move towards mass electrification, not niche electrification. Huge numbers of vehicles are entering the mass market. We aspire to electrify them with a true sense of Make in India and do it through deep localization. Whatever targets we keep for electrification should be practicable and centred around clear factors of consumer acceptance and local energy mix. That way, the shift to a cleaner future will be more sustainable.

HIOKI

BATTERY TESTER Series

NEW

Designing Automatic Battery Testing Systems is easier and fast then ever before

Measuring Battery Quality

Cells - Modules - Packs

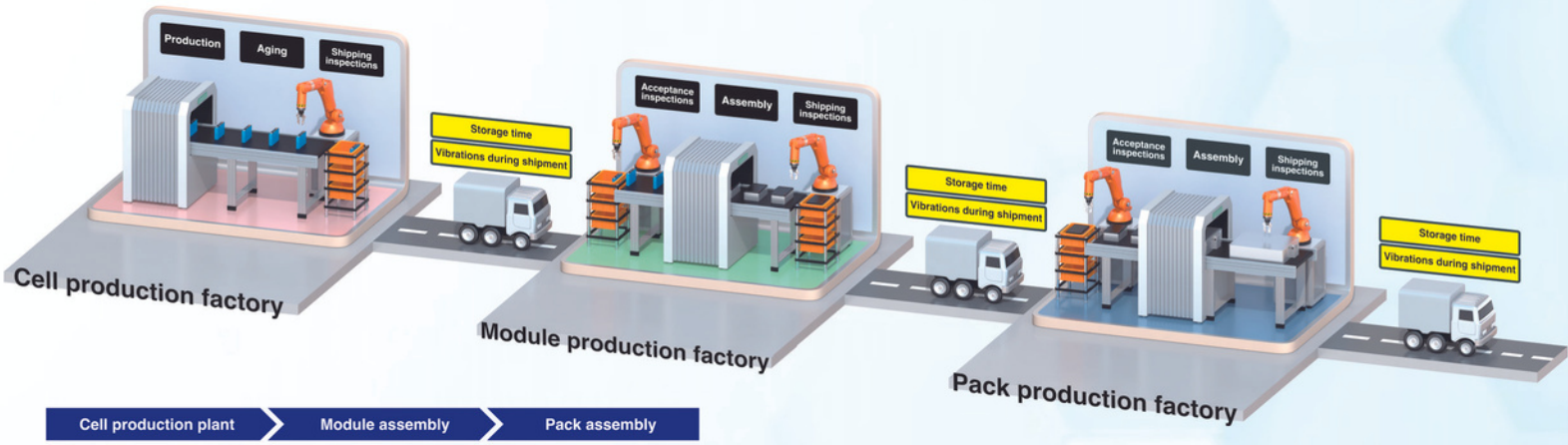
Quality Testing
Maintenance Inspections
R & D

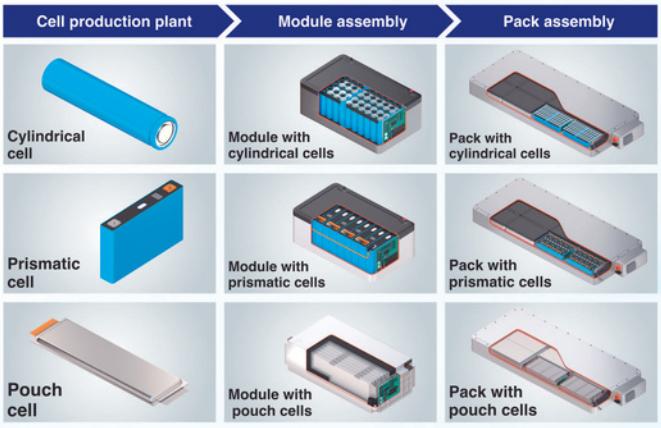
HIOKI Battery Testers are Ideal for use in Testing, Development and Inspections

*1 *2 Bluetooth When Z3210 is installed *2 Wireless Adapter Compatible

*1: BT3561A, BT3562A, BT3563A, BT3562-01, BT3563-01 only *2: BT3554-50, BT3554-51, BT3554-52 only

Measuring Battery Performance and Safety





Measuring battery performance and safety using internal resistance (AC-IR) and open-circuit voltage (OCV)

Our Battery testers meet these needs...

"We want to manufacture batteries with stable performance."

"We want to manufacture highly safe batteries."

Contact: 0124-4013811 7827978151 Email:- info@hioki.co.in / ravi@hioki.co.in

Address: Unit No. 123 & 124, 1st Floor, Suncity Business Tower, Golf Course Road, Sector-54,Gurgaon – 122003, Haryana, India

AUTOMOTIVE INDUSTRY STAKEHOLDERS AND IMPACT OF EV TRANSFORMATION - CHAPTER 2

The transformation of automobiles from ICE to EV powertrains will have a long-lasting impact on the automotive ecosystem. The second article of the series by **Dr Maruti Khaire (Head EV and Special Projects at SKF India)** is focused on all stakeholders, including new ones getting added due to the automotive landscape due to electric vehicles.

Automobile Industry – Value Chain Perspective

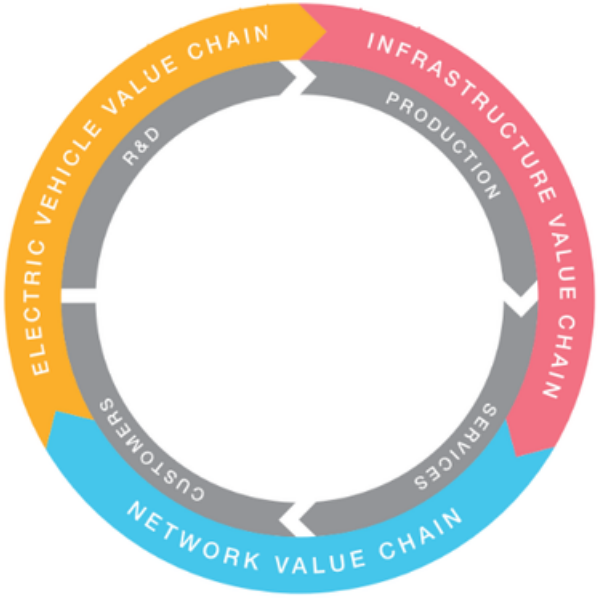


Fig 1 - Value Chain Perspective [Adopted from World Economic Forum White Paper "EV-Ready India Part 1: Value Chain Analysis of State EV Policies"]

At a high level, the industry ecosystem is constituted by Infrastructure, product, and supporting network system, and each of these players adds value to the complete ecosystem. Referring to figure 1 (from a World Economic Forum white paper), **the ecosystem has majorly three value chains – Product [EV], Infrastructure, and Network.**

- The product ecosystem is based on customer requirements – specifications, needs, and the ability to adapt the product to solve their problems. Customer is the key and pivotal point for product development where organisation R&D invests resources. The **product value chain** includes conceptualisation, development, and introduction of the product to market for customers to use.

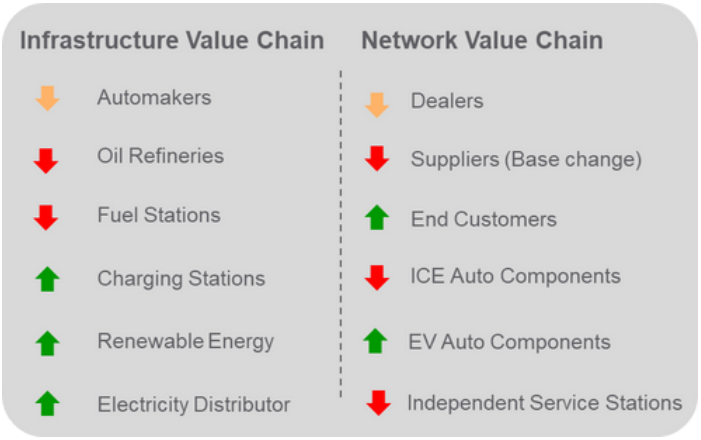
- **Infrastructure** is another key **value chain** that facilitates product growth as well as carves the path for next-generation products.

- The **network value chain** ensures that the ecosystem supports product upkeep and uptime. It also serves the important objective of feedback to complement the ecosystem as well as bridge the gap between customer and product expectations.

Automobile electrification is largely considered as the energy source change from fossil fuel propelled vehicles to electric energy-driven vehicles. However, it is not merely a change of energy source.

This article discusses the infrastructure value chain, network value chain, their stakeholders, and the impact of electrification on these stakeholders.

Automotive Industry Ecosystem – Stakeholders



Over the century, the automobile industry built the infrastructure for the fossil fuel ecosystem to produce, transport, and deliver the fuel that enabled the growth and sustainability of the industry. Infrastructure building takes structured and consistent effort over time. Infrastructure value chain players require a huge number of resources, including funds, human and environmental capital.

Major stakeholders of automobile Industry and impact of EV transformation

Infrastructure value chain stakeholders and impact due to EV transformation

Automakers

ICE automakers' infrastructure has been built and enhanced over time, and they have mastered the art of making vehicles by investing resources. Each automaker has its methods to produce reliable vehicles. **The transformation to an electric powertrain demands the cannibalization of a large part of this know-how**. However, the genitive impact is limited to fast transformation or turnaround to acquiring the new knowledge. In my opinion, the impact due to vehicle electrification is **neutral or short-term negative** for ICE OEMs if they adapt with the necessary vigour. The knowledge of building vehicles, established supply chain, market, as well as capital leverage and access to customers' voice are some of the competitive advantages for them and hence impact on these players will not be long term.

Oil Refineries

Most refineries focus on producing transportation fuels. Almost 60% of crude oil production is utilised for transportation purposes, according to an article by Vinni Malik in energyworld.com. There will be a **major impact on oil refineries' business due to vehicle electrification in the long term [2050]**. However, there can be possible parallel usage, and new products can be explored from fossil oils.

Sector	Consumption 2019 (mb/d)
Cars	22
Trucks	25
Other Transport (Aviation, Marine etc.)	13
Petrochemicals	10
Process Heating	6
Power	5
Other	19
TOTAL	**100**

Crude oil consumption (%)
Source: Article by Vinni Malik dated 30 Oct 2019.
https://energy.economictimes.indiatimes.com/

Fuel Stations

Fuel stations will experience a negative impact due to vehicle electrification in the medium to long term. Their business economics is highly dependent on the EV adoption rate in their geographical area. Some experts believe the contrary view that fuel stations may also benefit from electrification. **Fuel stations can start battery swapping operations to complement their current business**.

Charging Stations, Renewable Energy, Electricity Distributors

Charging stations can be powered via renewable energy (RE) or conventional energy. EV charging through RE will allow lower operational costs and green mobility in the true sense. A growing number of charging stations will positively impact RE generation and will be beneficial for DISCOMs in terms of additional load demand.

Network value chain stakeholders and impact due to EV transformation

Dealers

Alongside sales and service, dealers handle local product promotion, last-mile deliveries and ensure vehicle inventory based on the demand cycle. Dealerships are competent to handle sales & service of ICE vehicles. It is imperative that they maintain the resources to cater to both powertrains, as the two will co-exist for a considerable time. The sales vocabulary is changing with EVs, and it will impact the competence of the staff.

On the service front, the staff will need to handle problems significantly different from the ICE vehicles, such as software issues, electronic hardware issues, battery issues etc. EV transformation will have a major impact on the dealership business in the short to medium term, which should taper with necessary training. The learning curve needs to be quick to minimise the impact.

Independent Service Stations

In addition to OEMs 'network, a huge number of independent service stations exist for ICE vehicles. In India, not all the independent service station resources are well qualified for the job, though, many staff members acquire the know-how on the job. As EV powertrain systems are complex and sophisticated, the transition will impact the independent service network adversely. **Reskilling** the staff is key to continuing in this service business in the long term. In the short to medium term, the impact will not be so significant as they will still be a considerable population of ICE vehicles.

End Customer

EVs offer advantages of lower TCO, multiple new entrants and government subsidies etc. However, ICE vehicles provide the comfort of established infrastructure.

Component Suppliers

Automotive component suppliers with high or complete reliance on the ICE components need to relook at their offerings. If done correctly, these supply chain partners can even benefit by diversifying to EV powertrain. The diversification demands a major shift in approach as well as business models. The supply chain for EVs is a major challenge for OEMs and it is the greatest opportunity for the supply chain partners. EV Technologies, including batteries and motors, are fast-evolving and hence the component makers need to be watchful of their focus areas and global tech developments.

Social ecosystem stakeholders

Electric powertrain components require minerals like cobalt, manganese, silica, etc. A report by Amnesty International reveals human rights abuses, including child labour, in the extraction of cobalt and serious health risks to the mineworkers in Congo. In addition to human impact, spent EV batteries will need to be recycled. The recycling of batteries and other minerals requires investment, or these will end up in landfills and may cause damage. I leave this as food for thought. *In CHAPTER 3 (June 2022 magazine), we will strip down electric and ICE vehicle systems and assess the EV transition impact.*

ELECTRICAL STEEL PRICES A BIG WORRY FOR EV COMPONENT MAKERS IN INDIA

Pune based **Precision Pressing Manufacturers (PPM)** makes core stampings and assemblies used in rotating electrical equipment for the automotive industry, i.e. parts used in alternators and starter motors, wiper motors, and power window motors etc.

We caught up with **Shrivatsa Sinha** - Managing Partner at PPM to understand **how traditional automotive suppliers like themselves are preparing for EV transition.**

How will the transition to EVs impact a business like yours? How are you preparing to support future mobility products?

Transitioning to EVs will be a positive game-changer for our business. Currently, a relatively small value of our products is purchased for use in an ICE vehicle. With EVs, a much larger value of our products would be purchased. For future mobility products, we are constantly innovating and keeping up with new technologies being researched globally, evident with our early readiness for manufacturing EV components.

What new products have you introduced specifically for EV components?

Our range of products suits applications ranging from 0.5 kW to 150 kW power output. Includes **Slinky Hub Motor stator assemblies** for electric 2W & 3W applications, **Slinky cores used in BSG (Belt Starter Generator)** applications that have now seen end use in electric 2W & 3W applications coupled with a reducer, and **Axial Flux and Radial Flux cores** for various traction motor applications used in passenger and commercial vehicles.

For Axial Flux motors, we support many companies and researchers with stator core prototypes. Having established the process for quick prototyping, we are currently working to offer mass manufacturing solutions within the next three months.

What is the major reason so many EV motors and their constituent parts are still imported? What interventions would you suggest?

Lucrative pricing by Chinese and other Southeast Asian manufacturers for EV motors and motor components forces Indian manufacturers to import. Many OEMs import hub motor stator sub-assemblies and wind them in India to make so-called "Made in India" motors.

The dominant raw material in our products is electrical steel which is currently 35% cheaper in China as compared to India. If you compare apple to apple, we are more competitive than China in all other costs. If we could get raw materials at local Chinese prices, we would be cheaper.

The government's focus has been great at a macro level to develop the EV ecosystem since the demand is increasing with an extensive focus on component localisation. There needs to be some **intervention to control the unprecedented profiteering by electrical steel manufacturers in India.**

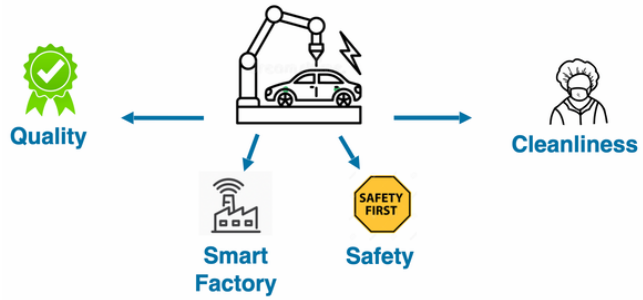
RECOMMENDED DISTINCTIVE PRACTICES FOR EV MANUFACTURING

Product engineering and process engineering need to go hand in hand to establish reliable EV and EV component manufacturing set-ups in India. **Himanshu Jadhav, CEO at Jendamark India, recommends practices to maintain an EV production line in order to achieve the right amount of precision and process security.**

Electronic components are indispensable to Electric Vehicles. These critical parts are small, difficult to handle and susceptible to failure. Such components require distinctive manufacturing practices in addition to the conventional manufacturing practices. This involves everything from selecting the right site to building the right factory and selecting the right type of assembly line with the right mix of automated and manual operations. To the extent that even the attire that the employees wear needs to be carefully chosen.

Recommendations for efficient and safe EV manufacturing practices can be divided into the following sections. A combination of these is needed to set up a world-class manufacturing unit while avoiding safety risks within the factory and with the end product.

- Cleanliness and static charge free environment
- Process security and safety
- Quality of final product and its sustainability
- Smart factory / Industry 4.0 solutions

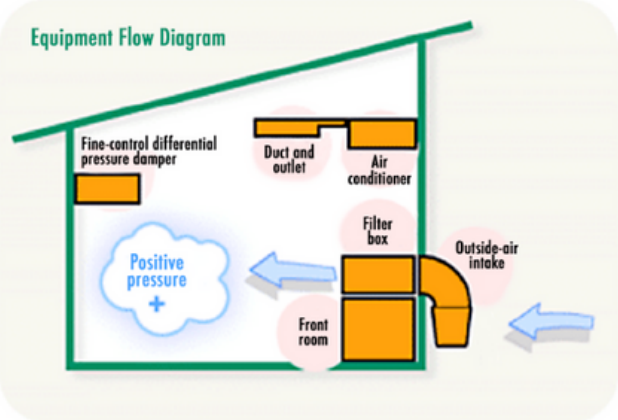


Cleanliness and a static charge-free environment

- **Air showers** should be incorporated at the entryways of assembly halls and other controlled environments **to reduce particle contamination.**
- **Maintain cleanrooms** to control the environment by limiting the presence of sub-micron particles and modifying inadequate environmental conditions.
- Assembly halls should have **automated roller shutters** as they have a low permeability, that guarantees controlled loss of pressure and allows the ventilation systems and air purification to operate correctly.
- **Bristled tire cleaning mats** should be placed at the entrances of the production facility to reduce the dirt coming inside assembly halls, mainly brought in by logistic vehicles and shoes.

- **Cellulose filter papers** are diverse tools for microfiltration that work by trapping particulates within a random matrix of cellulose fibers. These should be used for the determination and identification of particulates in liquid and gas samples.

- **Positive air pressure system** should be deployed to ventilate confined spaces. Consequently, if there is any leak from the positively pressured system, it will egress into the surrounding environment.
- **Lint-free** clothing, head caps and cleaning materials should be used as it is less likely to build up a charge and cause electro-static discharge (ESD) that can damage the electronic equipment.



- **Latex-free paper** should be used in cleanroom environments, where the prevention of chemical exportation and particle contamination is critical.

Process security and safety

Process quality should be planned during the inception stage of the plant. Process security measures imply reliability and repeatability in the assembly process. It also ensures that the process is followed consistently irrespective of the skill of operators, time of the day or volume being produced, and to an extent, product variations.

The key to process security is achieving a fine balance between the financial and operational sides. A high level of automation generally ensures high process security, but it comes at a price. Intelligent process design is needed to ensure a safe, reliable process with optimum automation, a good mix of mechanical and electrical poke yokes and smart planning.

- The aim while ensuring the safety of the EV components should be that the electrostatic charge should remain neutral. The use of **ESD controlled** entrances, flooring, mats, gloves, bands, shoes etc., reduces the chances of someone creating a static discharge through physical contact. ESD protected trolleys, insulated & isolated sockets, and ionizers should be used while handling the EV components.
- **Tool sockets should be insulated** or isolated from each other to allow for tightening operations without charge passing through them. Such sockets protect operators and the tools & machinery used in tightening operations - like busbar and PCB tightening.

- For enhanced visibility of critical components, light lux of environments where EV components are produced is best maintained between **700 and 800 lux.**
- **Automated single screw feeder** should be used for hassle-free handling of small screws to ensure that the right screws are used every time and no loose screws drop into the component.
- Controlling temperature and humidity are crucial for cleanrooms. A **fume extraction** unit should be used to pull fumes and dust particles coming out of soldering into a contained filtration system.

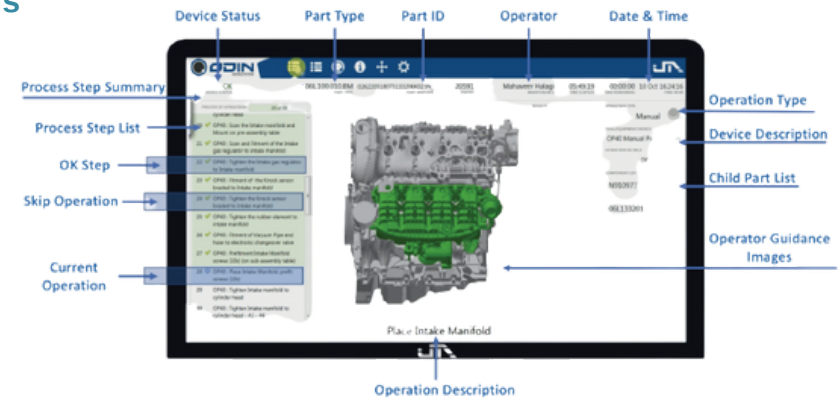
Quality of final product and its sustainability

It's one thing to make a good product and another to make the same product at scale. The challenge is to maintain good product quality over time. There could be issues in input parts, variance in manual work due to unskilled operators, machine tolerances and material defects. The ideal way is to eliminate all of these, which is not practically possible. At the least, one should ensure that the final product quality is not affected by these factors. If unavoidable, there should be mechanisms in place so that such parts get rejected, and dispatch to the customer is avoided.

The use of **smart vision systems** which detect and isolate defects is a good example. The use of AI-based self-learning modules can track and monitor product variance over time, **digitisation of the PDI (Pre-delivery Inspection**) **station and torque checks, automated EOL, image referencing and linking the OK/Dispatch barcode to certification** of the release of a product is key. **No part should get dispatched unless released from an intelligent system-driven solution.**

Smart factory / Industry 4.0 solutions

It is necessary to design the EV components and vehicle manufacturing factories as smart factories, which allow easy monitoring and traceability. Automation with low-cost digital solutions to control process security is, in our opinion, the way forward.



The idea is to have a more HUMAN centric approach, make the existing workforce more efficient and avoid errors in the process. Automation, powered by the solutions of the 4th Industrial Revolution, will play a big role in the future of EV manufacturing. For instance:

- For critical components like PCBs that include numerous parts, usage of **pick to light** racks at assembly station will ensure that the right parts are picked in the right sequence.
- For operations that require bolting, using an automated system that will feed the bolts and tighten them in the required sequence and torque, will eliminate the possibilities where a manual operation might have caused errors.
- Likewise, solutions like **operator guidance systems** for assembly stations, data analytics, and vision systems for inspection will ensure that the assembly process is seamless and will vastly reduce the margin of error.
- The use of cloud computing to store, access and analyse data is vital. Using digital solutions not just for production but also for maintenance and logistics is key.

At Jendamark, we have been pioneers in consulting and supplying assembly lines for EV component manufacturers for battery packs, motors, inverters, transmission and e-axles. Reach us at www.jendamark.in / info@jendamark.in / +91 77 2202 7005.

ABOUT CHARGE+ZONE

CHARGE+ZONE is building Electric Vehicle Charging Service Infrastructure globally integrated with its indigenously developed IoT based Charging Station Management System (CSMS) & Mobile Application. The company was incorporated in July 2018 and has made strides by installing more than 750+ charging points across India as of March 2021.

Video Wall, 7.7kW AC Type 2 Dual Gun Charger

SPECIFICATION

- **Input :** 415V AC 3 Phase, 32A Max., 50 Hz
- **Number Outputs / Guns :** 2 Each Output connector rating : 240V AC, 32A Mx, 50 Hz
- **Output Power :** 7.7 KW x 2
- **Output connector type :** IEC62196 - 2 Type 2 Plug , 5m cable
- **Protection :** Over Voltage , UnderVoltage , Over Current , Residual Current , Short Circuit , Over Temperature , Ground Fault , Surge Protection
- **Push Buttons :** Emergency Stop
- **Ambient Temp. :** - 25° C to + 45°C
- **Humidity :** < 95 %, Non condensing
- **Altitude :** Up to 2,000m
- **User Interface :** Vertical 55" HD Display , status indicators ,
- **User authentication :** QR code / RFID / OTP
- **Communication :** OCPP 1.6 J Forced Cooling , Floor Mounting
- **Complies to :** IEC 61851-1, IEC 61851-21-2
- **Installation :** Semi Outdoor
- **Communication Interface :** Ethernet / Wi-Fi / GSM
- **Mechanical :** 850 x 2250 x 300 MM (Appx)
- **Ingress protection :** IP54

8" Screen, 7.7kW AC Type 2 Dual Gun Charger

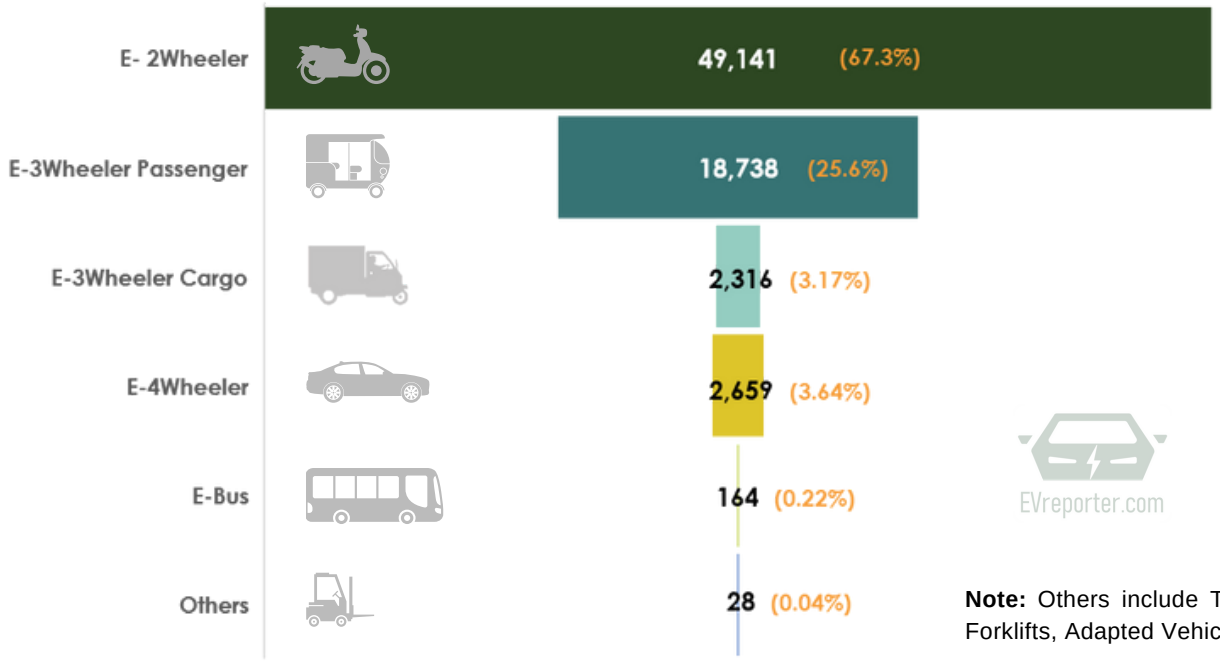
SPECIFICATION

- **Input:** 415V AC 3 Phase, 32A Max., Number of Outputs :2
- **Each Output connector rating:** 240V AC, 32A Max,50 Hz
- **Output Power:** 7.2 KW x 2
- **Output connector type:** IEC 62196-2 Type 2 Plug, 5m cable
- **Protection:** Over Voltage, Under Voltage, Over Current Residual Current, Short Circuit, Over Temperature, Ground
- **Fault Push Buttons**: Emergency Stop
- **Ambient Temp.:** -25°C to +55°C
- **Humidity :** <95%, Non-condensing
- **Altitude :** Upto 2,000 m
- **User Interface:** 8" LCD screen, status indicators, user authentication by QR code/ RFID/ OTP
- **Communication:** OCPP 1.6J Natural Cooling, Floor Mounting
- **Complies to:** IEC61851-1, IEC61851-21-2
- **Communication Interface:** Ethernet/WiFi/ GSM
- **Mechanical:**350W x 300D x 1525H (**all Dimensions are in MM)
- **Ingress protection:** IP54 50 Hz

+91-7227025948
info@chargezone.com
www.chargezone.com
401, Benison Complex, Oppo. To Shiv Mahal Place, Old Padra Road, Vadodara - 390007

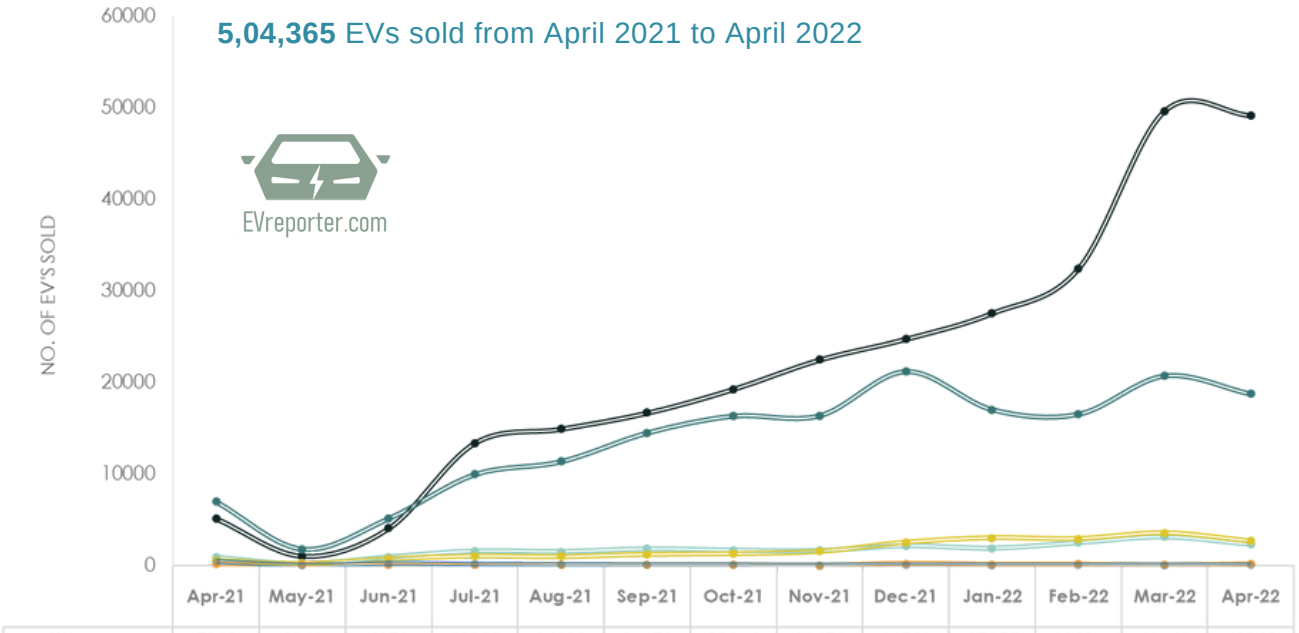
Category-wise Electric Vehicle sales, April 2022

Total Registered Electric Vehicle Sales - **Apr '22 - 73,046** | Mar '22 - 77,137



Note: Others include Tractors, Forklifts, Adapted Vehicles, etc.

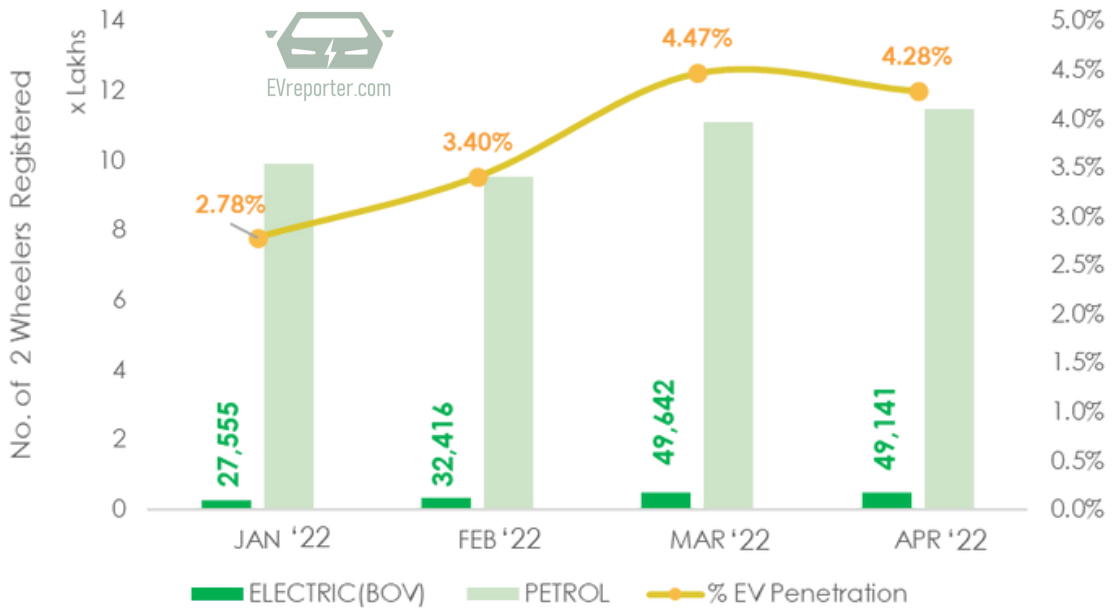
Category wise-Sales Trend from Apr 2021 to Apr 2022



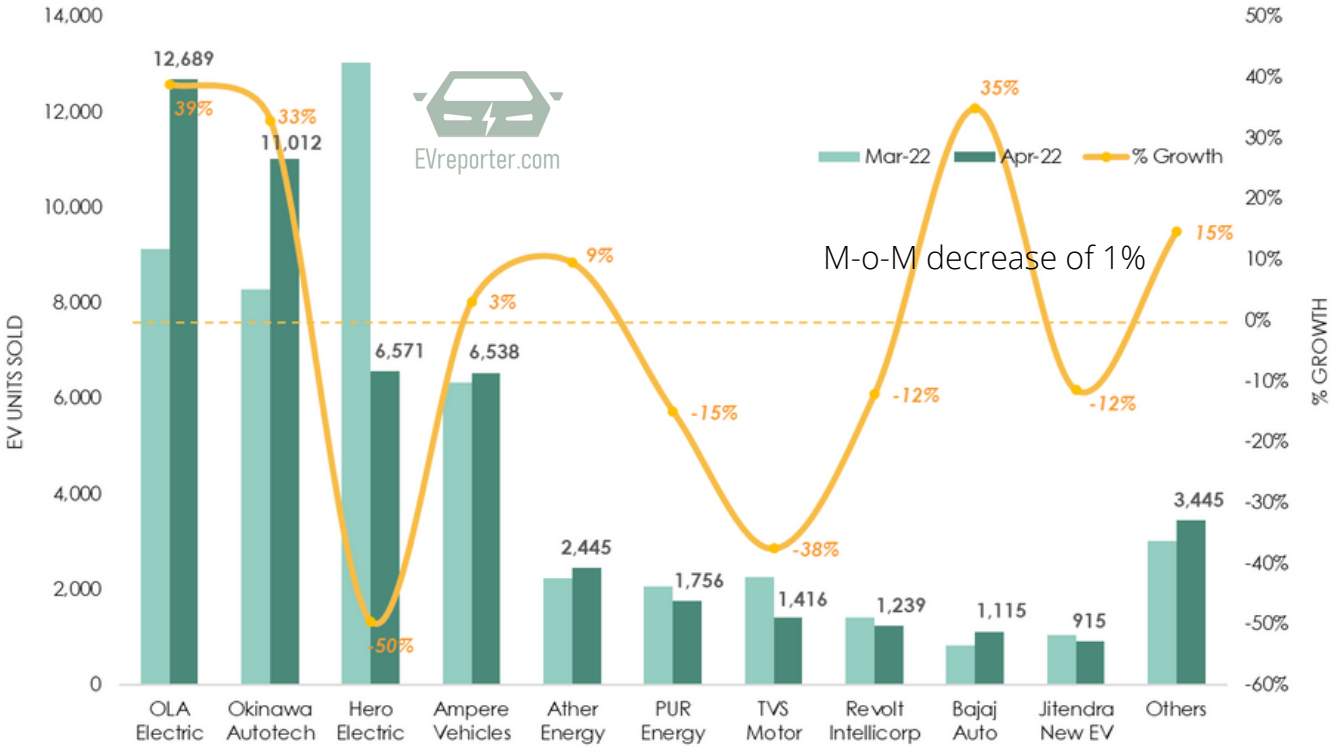
	Apr-21	May-21	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22
2W	5132	1040	4073	13389	14911	16672	19264	22474	24732	27555	32416	49642	49141
3W Passenger	6968	1805	5147	9962	11366	14505	16340	16383	21208	17039	16540	20731	18738
3W Cargo	879	139	923	1582	1519	1825	1671	1632	2162	1893	2509	3146	2316
4W	597	241	766	1063	999	1250	1320	1559	2548	3,020	2933	3,545	2659
e-Bus	155	84	70	44	80	79	84	34	221	126	133	76	164
Others	447	2	219	142	86	47	43	18	25	27	21	29	28
Total	**14179**	**3311**	**11198**	**26181**	**28961**	**34379**	**38722**	**42108**	**50899**	**49660**	**54552**	**77169**	**73046**

Source: Vahan Dashboard. Data as per 1429 out of 1613 RTOs across 33 out of 37 state/UTs

Fuel wise 2-Wheeler Sales Trend, Jan to April 2022

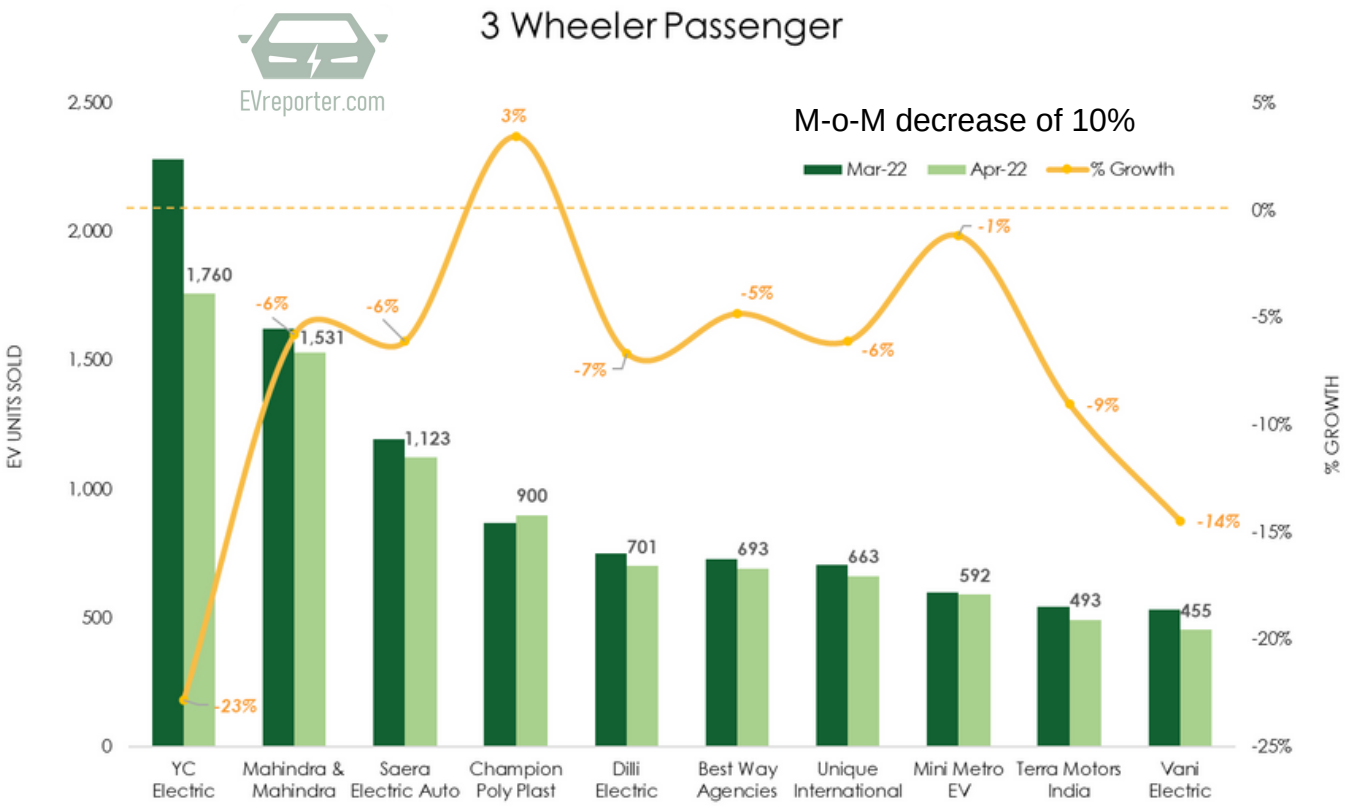


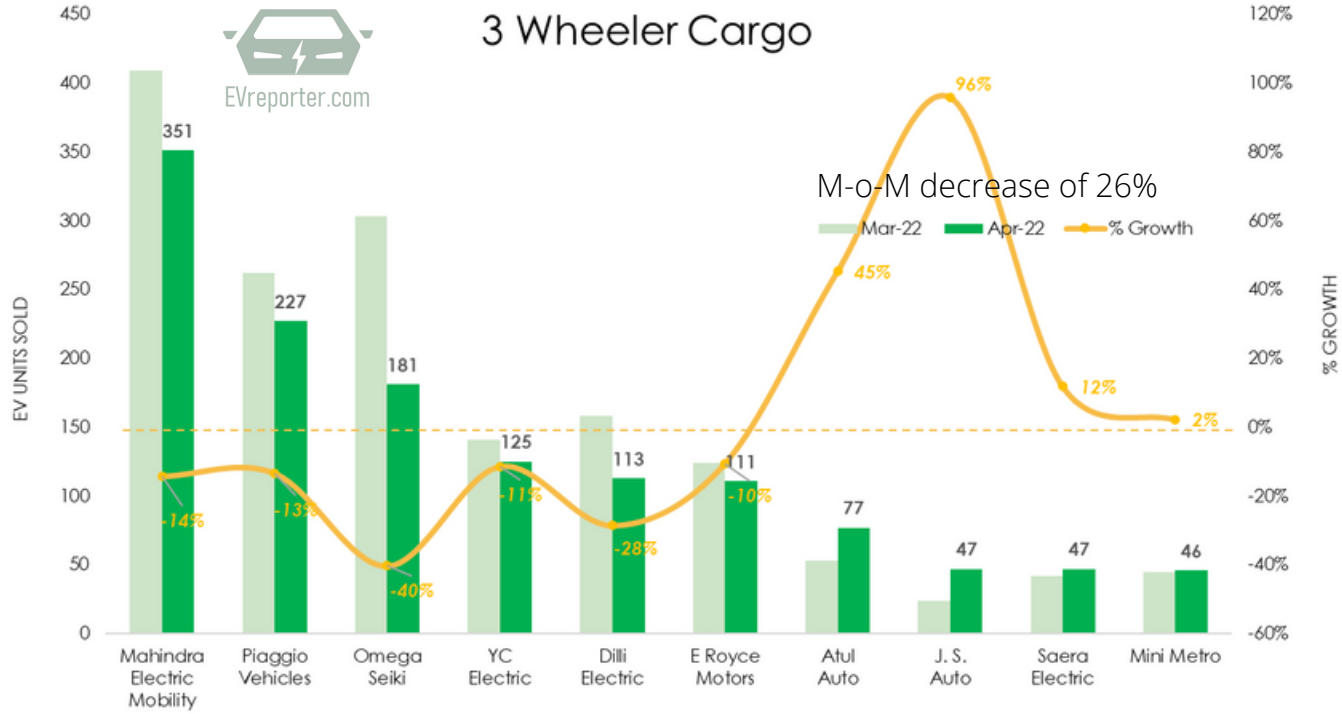
High Speed E - 2Wheeler Sales Trend by OEM, Apr 2022



Source: Vahan Dashboard. Data as per 1429 out of 1613 RTOs across 33 out of 37 state/UTs
Note: Low speed Electric 2 Wheelers data is not included

Electric 3 Wheeler Sales Trend by OEM, Apr 2022





For E-3W Passenger and Cargo vehicles, the top 10 OEMs contributed only 48% and 57% of the sales respectively, in April 2022.

Source: Vahan Dashboard. Data as per 1429 out of 1613 RTOs across 33 out of 37 state/UTs. The aim of these graphs is to represent an overall trend of the new EV registrations in India.

Manufacturer-wise Electric 4 Wheeler Sales performance

	OEM Manufacturers	MAR	APR	Difference	% Change	% Market Share Apr 2022
1	Tata Motors	3357	2322	-1035	-31%	87%
2	Mg Motor	94	239	145	154%	9%
3	Hyundai	18	23	5	28%	1%
4	BYD	18	21	3	17%	1%
5	BMW	9	16	7	78%	1%
6	Mahindra & Mahindra	18	13	-5	-28%	0%
7	Mercedes -Benz	6	10	4	67%	0%
8	Others	25	15	-10	-40%	1%
	Total	**3545**	**2659**	-886	-25%	100%

Others include JLR, Porsche, etc.

Source: Vahan Dashboard, Company press releases.
Data as per 1429 out of 1613 RTOs across 33 out of 37 state/UTs.

Manufacturer-wise Electric Bus Sales performance

	OEM Manufacturers	MAR	APR	Difference	% Change	% Market Share Apr 2022
1	JBM Auto Limited	35	49	14	40%	30%
2	PMI Electro Mobility	19	47	28	147%	29%
3	Tata Motors	4	38	34	850%	23%
4	Olectra greentech	18	30	12	67%	18%
	Total	**76**	**164**	88	116%	100%

Source: Vahan Dashboard. Data as per 1429 out of 1613 RTOs across 33 out of 37 state/UTs.

Our Recent Editions

Annual print subscription at INR 2999

Advertise with EVreporter magazine

GET MONTHLY EVREPORTER PRINT MAGAZINES | SCAN TO SUBSCRIBE

Write to us at info@evreporter.com
To know more about how we can help you promote your brand, visit our *services page*.