



Gandhinagar Institute of Technology

A Report on
“Electric Vehicles Modelling and Future Adoption”
Sponsored by GUJCOST and DST
(25th - 26th November 2020)

Objective:

The program will provide a valued platform for the industry specialists and academicians from institutes to understand exchange and explore the new developments in field of Electrical Vehicles and new battery technology that makes the faster adoption of EVs.

About Webinar:

This webinar will be discussing the innovation in electric vehicles technology. It will also aim to understand the concept of vehicle modelling, battery chemistry, drive train and future load demand and charging infrastructures. It explains why electric vehicles are important as a replacement of conventional engines. Major thrust area targeted:

- Government policies and incentives
- Future load demand and challenges
- Prospective of Electric Vehicles
- Connected Vehicles, a new paradigm in the world of IOTs
- Challenges for EV and Hybrid Electric Vehicles in India
- Electric Mobility in India: Why? What? When?
- Powertrain for Electric Vehicles
- Electric vehicle modelling

About the Institute

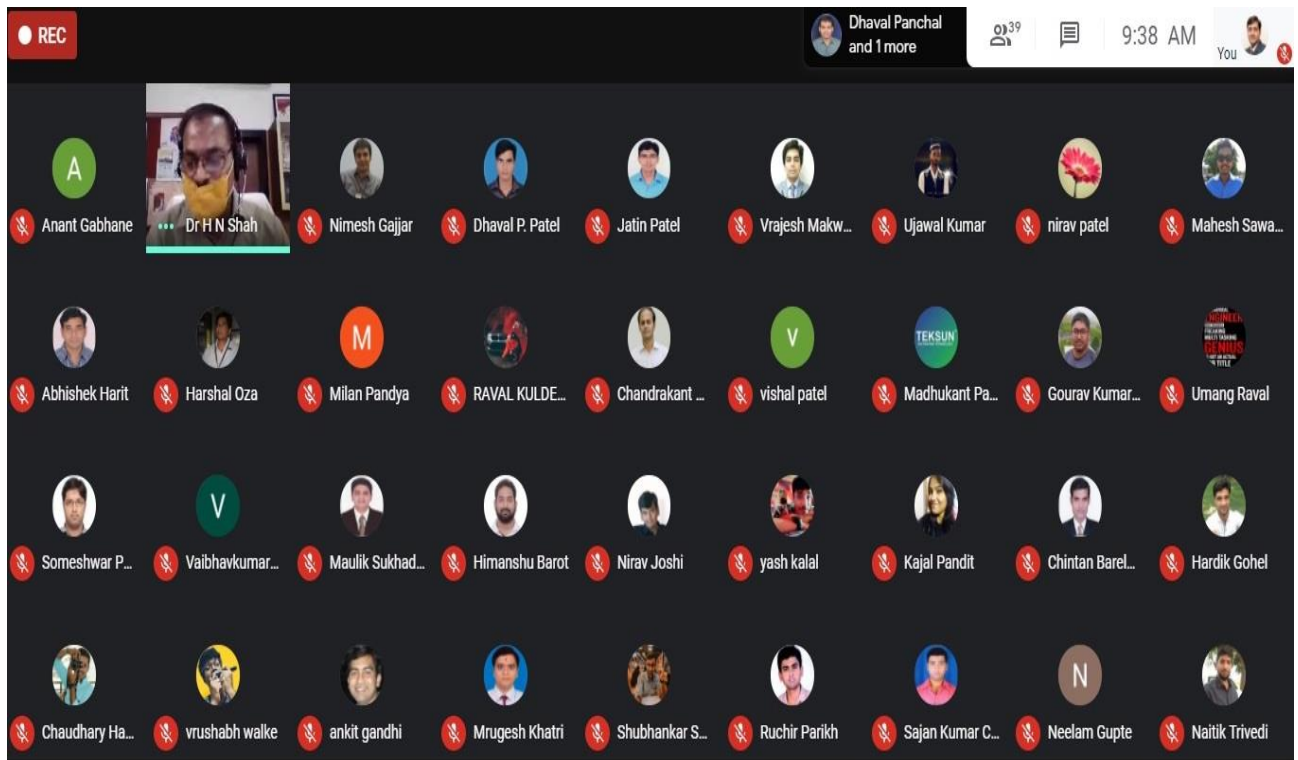
Gandhinagar Institute of Technology has been established by Platinum Foundation in 2006. The Institute is affiliated with Gujarat Technological University and approved by AICTE New Delhi. The Institute aims to be a leading center for research and engineering study, pursuing knowledge in both fundamental and applied areas, and collaborating closely with business and industry in promoting technological innovation and economic development. It offers a bachelor's Program in ME/CE/IT/EC/EE/CL. It also offers M.E. in Mechanical Engineering with specialization in Thermal Engineering and CAD/CAM and M.E. in Software Engineering in Computer Engineering. It also offers MBA Program with specialization in Marketing, Finance, Human Resource and Information Technology. It runs an active local chapter of NPTEL, IIT Madras, ISHRAE, SAE, 4-star rated Open-Source Technology Club, Mobile, and Wireless Technology Club. GIT always strive to focus on real-time dynamic problems for projects and laboratory work and as a result, recently our student's team performed well and won a smart India Hackathon at IIT Kanpur, MHRD, Govt. of India initiation.

Day-1 (25/11/2020)

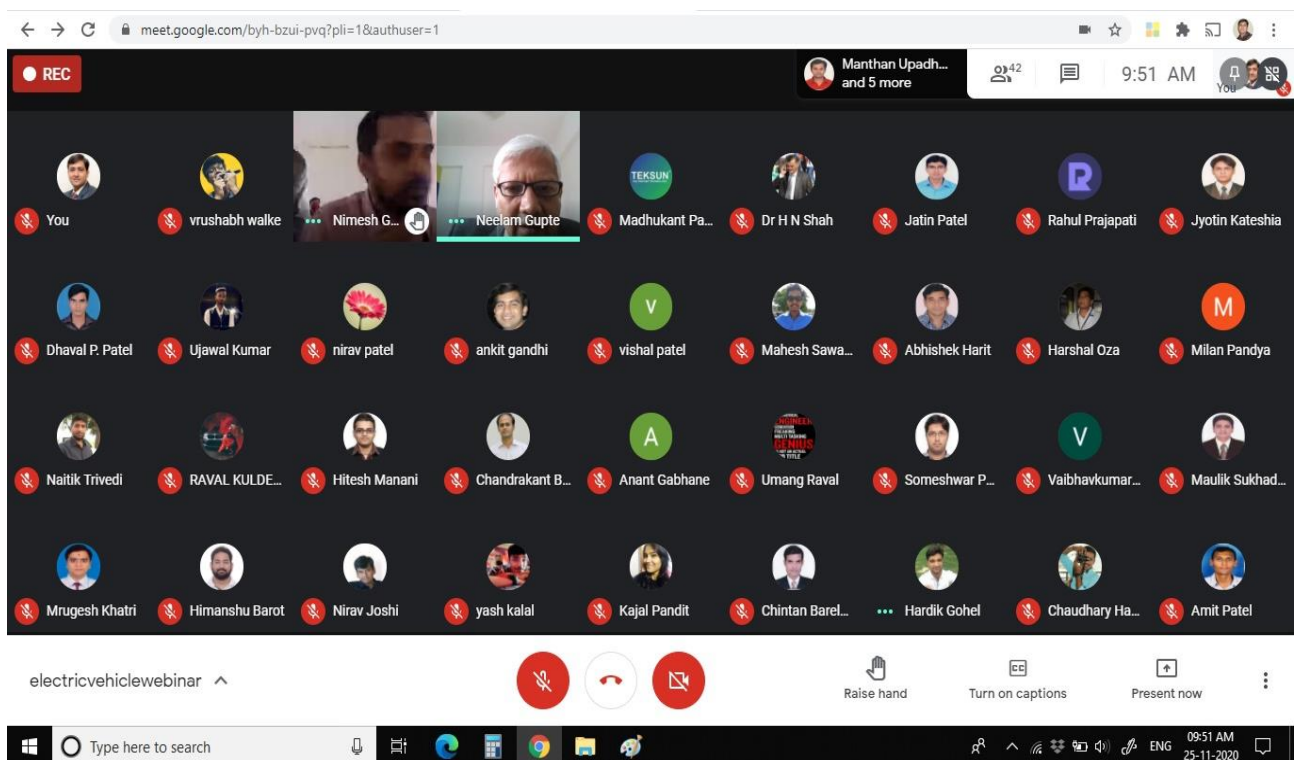
Inauguration Session

The webinar started with an Inaugural speech by Dr Nimesh M Gajjar, Assistant Professor, Gandhinagar Institute of Technology. He welcomed all the dignitaries & participants. Dr. H N Shah, Director, Gandhinagar Institute of Technology had addressed the participants and discussed about the institute. He motivated all participants to take actively part in this webinar.

On the first day, the topic covered on “What is EV, Challenges of EV/HEV, An IoT connected to Vehicles and Industry 4.0 Technology Pillars”. Questionaries’ sessions were also arranged for the participants.



Speaker 1: Dr. Sudhir K Gupte,
(Sr. organizing committee member of “BAJA SAE INDIA” & “SUPRA SAE INDIA” and
Engineering Consultant - “Prarambh Engineering Consultancy)
Time: 9:30 am to 11:00 am



Dr. Sudhir K Gupte covered the topic on “Challenges of EV/HEV in India.” He was explained in more on Automobile Past, Present market and EV/HEV. Design and development process of automobiles sector, Electric vehicles setting a course for 2030, recent auto news and Buzzword in Auto industries these all are of Challenges of EV/HEV.

meet.google.com/byh-bzui-pvq?pli=1&authuser=1

REC Neelam Gupte is presenting

9:54 AM

"Challenges for EV / HEV In India"

Over View

- Automobile Markets–Past, Present & EV / HEV
- Process of Automobile Design & Development
- Electric Vehicles setting a Course for 2030
- Recent Auto News & Buzz word in Auto Industry
- Process of Vehicle Development
- What's in store for Future

There by

Challenges for EV / HEV in India & Way Ahead For Us

– Role of Teacher's (need to ponder/Contribute): –An Eye opener

Parambh Engineering Consultancy
www.parambhconsultancy.in
25th Nov 2020

Recent Past

Fuel Prices
Global Impact
Govt. Scams News

Automobile Domestic Sales Trends

Category	2010-11	2011-12	2012-13	2013-14	2014-15
Passenger Vehicles	25,01,542	26,29,839	26,65,015	25,01,506	26,01,236
Commercial Vehicles	6,84,905	8,09,499	7,93,211	6,32,851	6,14,948
Three Wheelers	5,26,024	5,13,281	5,38,290	4,80,085	5,32,626
Two Wheelers	1,17,68,910	1,34,09,150	1,37,97,185	1,48,06,778	1,59,75,561
Grand Total	1,54,81,381	1,73,61,769	1,77,93,701	1,84,23,223	1,97,24,371

Parambh Engineering Consultancy
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25th Nov 2020

electricvehiclewebinar

REC Neelam Gupte is presenting

He also explained automobile domestic selling trends from 2009 to 2015 as category wise like Passenger Vehicles, Commercial Vehicles, Three-Wheeler, and Two-wheelers. He shared the vision and target of AMP-2026 (Automotive Mission Planning-2026) through Make in India, Skill India, and "ATMA NIRBHAR BHARAT". He explained the scope of improvement in EV/HEV as battery revolutions. At finally he passed the message to teachers need to more contribution on this way with an eye-opener.

Speaker 2: Dr. Madhukant Patel
(CTO, TEKSUN Cultivating Technology and Ex-scientist and engineer in ISRO)
Time: 11:30 am to 1:00 pm

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REC Neelam Gupte

REC TEKSUN Madhukant Patel is presenting

Dhaval Panchal and 21 more

TEKSUN CULTIVATING TECHNOLOGY

The Connected Vehicles

- Not only generat virtually and the
- Historic: new ene without country, charge,
- Imagin
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USER AND ADMINISTRATOR

Application Layer

Cloud Services Layer

Virtual Object Layer

Clustered Objects

Objects

Object Layer

Clustered Objects

Objects

APPS

USER

Cloud of Things

Physical Objects

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TEKSUN

Madhukant Patel

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REC Neelam Gupte REC Madhukant Patel is presenting Maulik Sukhadiya and 21 more

TEKSUN Madhukant Patel

• Not only generat virtually and the

• Historic: new ene without country, charge,

• *Imagin*

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HUGE TECH POOL FUELS AMBITIONS OF WANNABE GIANTS
Now, local electronic design centres wow the world

K Yati Rajawat
MUMBAI 22 FEBRUARY

THERE is a quiet revolution in progress which, if things go well, may eventually make India one of the world's leading electronic design centres. The number of Indian companies active in the field of design are growing and new ones are mushrooming every day. The vast number of engineering graduates, especially electrical engineers who graduate from Indian universities, are being cited as the reason why India's importance is growing.

Two of the largest electronic design automation companies in the world, Cadence and Synopsys, have their development centers in the country, a fact which lends credence to India's prospects.

The other large companies in this industry — Texas Instruments, ST Microelectronics, National Semiconductor, Analog Devices, Philips and Motorola — are also setting up their Indian design centres.

Chips Of The New Block
Projects By Emerging Companies

Composites	Area Expertise
Accel Technologies	Design and training services in VLSI
Bitways	Embedded systems, Design services in VLSI integration technologies
Chip Engines	Design Services, ARM, ARM, SONY/SDH, Digital Ethernet
Electronet	FPGA Design, VHDL/Verilog, VLSI Design
CG Design Design	FPGA Design, VHDL/Verilog, VLSI Design
ReesChip	Design Services, Soc, Embedded Systems, Vair Communications
Semiconductor	ASIC Design, Development, Fabrication, Packaging and quality assurance and VLSI education (A OOI unit)
Transchip India	VHDL, ASIC Design
Vincha	IPs in USB, PCI, Wireless Ethernet 802.11b and ASIC Design Services

indigenous companies, such as Silicon Automation Systems, Arcus, Armedia, Wipro and SiCO — are emerging as global success stories in chip and IP design. Ready? Presenting their Indian design centres.

"We have around 150 engineers in our centre in India." China has already attracted most of the manufacturing capacity in high tech areas, ranging from PCs, peripherals, semiconductors and cell phones.

MNCs, small cos: Page 4

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REC Madhukant Patel is presenting Anushah walle and 21 more 11:58 AM You

REC Madhukant Patel is presenting Chetan Sutar and 17 more 12:32 PM You

TEKSUN Madhukant Patel

Industry 4.0 - Technological pillars

Advanced Robotics

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Dr. Madhukant Patel was covered with the topics basically connected devices of Vehicles, Fundamental of IoT, Real use-cases of AI in EV, Teksun IoT and EV and more technology about Teksun. He explained in detail the performance optimization through IoT as Power of connected vehicles and Archiving data of Road conditions, Climate conditions, Battery conditions, Load carrying conditions, also Traffic Sensitivity. At last, he also more illuminate in “Industry 4.0 Technology Pillars” with advance robotics point.

Speaker 3: Prof. Nirav Joshi

(Assistant Professor & Head of Mechanical Engineering, Gandhinagar Institute of Technology)

Time: 1:30 pm to 3:00 pm

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REC Nirav Joshi is presenting

Kajal Pandit: hia and 10 more

22 1:10 PM You

Need of Electric Vehicles (EV)

Prof. Nirav Joshi
Mechanical Engineering Department
Gandhinagar Institute of Technology

electricvehiclewebinar

Raise hand Turn on captions Nirav Joshi is presenting

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01:10 PM 25-11-2020

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REC Nirav Joshi is presenting

Shubhanker Sha... and 21 more

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REC Nirav Joshi is presenting

Jatin Patel and 15 more

1:22 PM You

Conventional ICE powered vehicles: Current Generation

- What are the challenges:
 - Initial cost of the vehicle is become more and more
 - Servicing cost, consumables are becoming more expensive
 - Fuel cost – Increasing due to limited reserves
 - To meet the emission norms, added equipment are making the already expensive machine more expensive
 - Impact over the environment is more prominent
 - Per KM cost of ownership is becoming more expensive

What is EV, In India?

- Battery Electric Vehicles (BEV)
 - TATA Nexon EV
 - Hyundai Kona EV
 - MG ZS EV
- Plug-in Hybrid Electric Vehicle (PHEV)
 - Toyota Prius PHEV
 - Volvo XC90
- Hybrid Electric Vehicles (HEV)
 - Lexus Hybrid
 - Toyota Camry Hybrid

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01:22 PM 25-11-2020

Prof. Nirav Joshi was explained on the topic “Need of Electric Vehicles”. Firstly, he explained convectional ICE-powered vehicles: Current Generation as “What We Have?” and “What are the challenges?” After that, he gave a solution regarding the topic of EV. He had a briefing on “What is EV” with details of its types “What is BEV” then “What is PHEV” and “What is HEV”. Also covered in the session, Why EVs are better than ICE cars?

Day - 2 (26/11/2020)

The second day of the webinar commenced with the speech of Prof. Hardik R Gohel, Assistant Professor, Gandhinagar Institute of Technology. He welcomed all the experts on the second day and briefly introduced them. On the second day session the topic covered “Battery chemistry, drive train and future load demand and charging infrastructures”. Feedbacks and Questionaries’ sessions were also shared with the participants. At last Prof. Nirav Joshi, Head of Mechanical, give the vote of thanks to all the experts, dignities & participants, the Director, sponsors, the organizing committee, and all staff members who made this event success concluded the webinar.

Speaker 1: Dr Suketu Jani

(Assistant Professor, Indus Institute of Technology & Engineering)

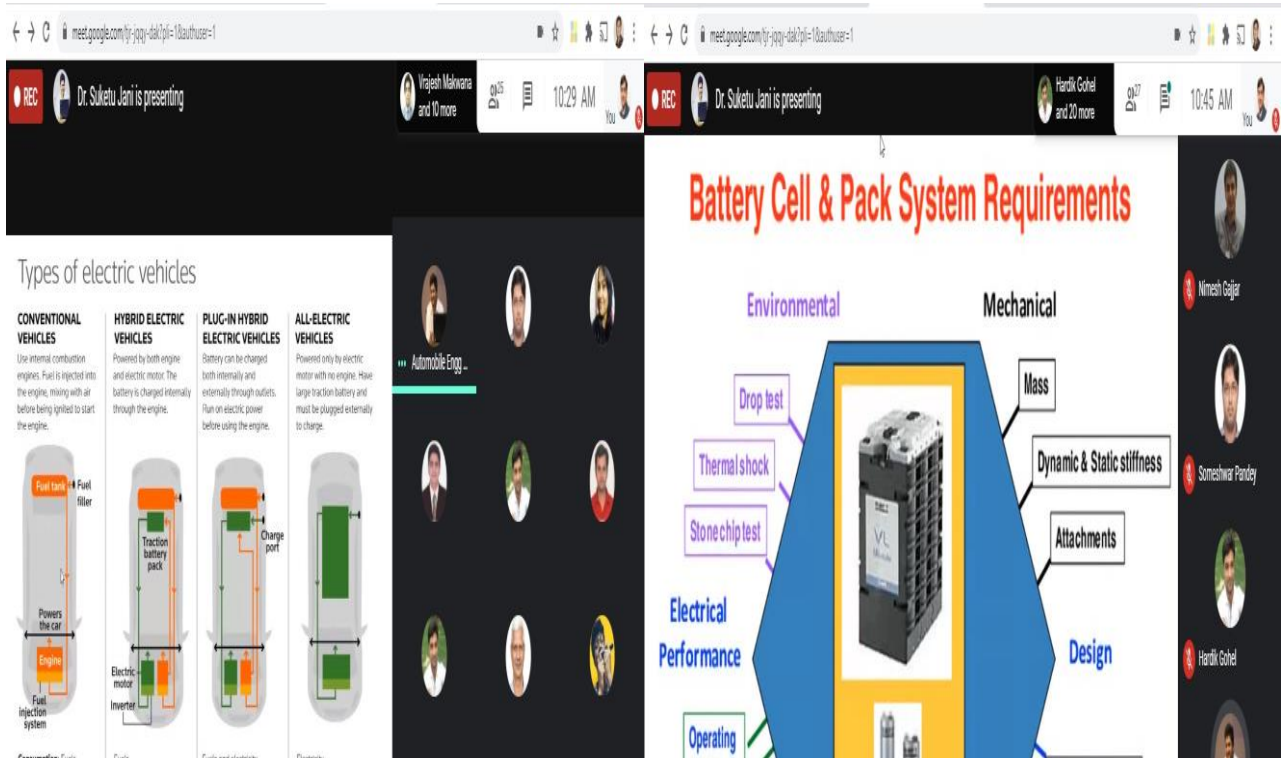
Time: 9:30 am to 11:00 am

The screenshot shows a Google Meet interface. At the top, it says "Dr. Suketu Jani is presenting". The main content is a presentation slide with the title "Electric Vehicles Scenario in INDIA & its Future Prospects" and a blue wireframe image of a car. The presenter's name and affiliation, "Dr. Suketu Jani, Head of Department, Automobile Engineering Department, Indus University," are listed at the bottom of the slide. On the right side, there is a grid of participant avatars. The bottom of the screen shows the Windows taskbar with the search bar and system tray.

The screenshot shows a Google Meet interface with a presentation slide titled "IndiaSpend". The slide contains several statistics and charts:

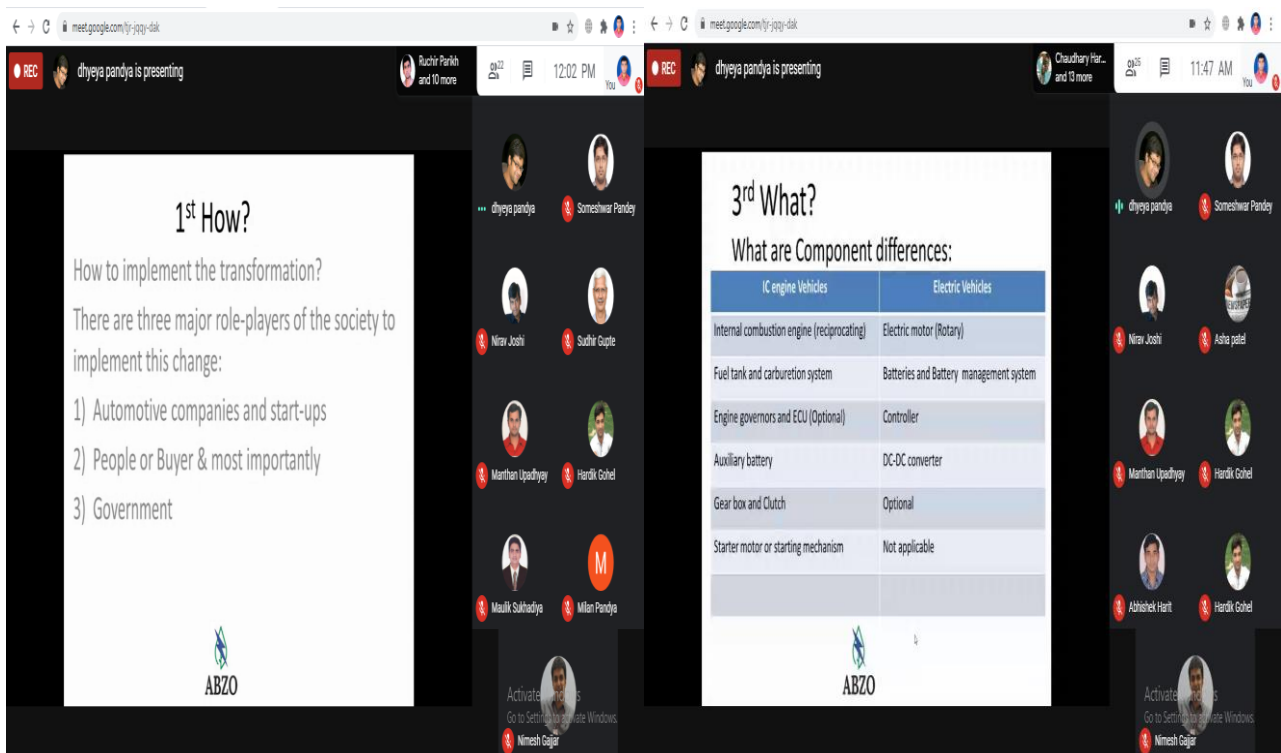
- TAKING THE LEAP:** 87% Ready to switch for clean air; 12% Would switch to avoid using petrol, diesel; 900,000 EVs sold in 2017; 4% Of volume of diesel and petrol vehicles sold.
- ILL HEALTH FROM POOR AIR QUALITY:** 55% Irritate breathing; 51% Headaches; 51% Coughing.
- THE CHALLENGE:** 60% People cited lack of charging stations near homes; 46% cited inadequate driving range; 25% said EVs too costly to range they deliver; 31% said EVs take too long to recharge; 22% Slow pace of govt policies on EV sector.
- CAUSE FOR CONCERN:** 11% of India's carbon emissions due to transportation; 14 of world's top 20 most-polluted cities are in India.
- SUFFERING FROM POOR AIR QUALITY:** 74% Mumbai; 91% Delhi; 71% Bengaluru; 76% people surveyed; 70% Kolkata; 78% Hyderabad; 75% Chennai.
- TWO-WHEELERS WILL DRIVE EV MARKET GROWTH:** India is the world's third-largest market for automobiles; About 25 million internal combustion (IC) engines sold in 2017; 80%, or about 20 million of those were two-wheelers; Less than a million electric vehicles sold in India; This is 4% of IC engine vehicles.

The slide also features a map of India with markers for Mumbai, Delhi, and Bengaluru. The bottom of the screen shows the Windows taskbar and the Google Meet control bar with icons for mute, video, and chat.



Dr. Suketu Jani has covered the topics on “Electric Vehicles Scenario in India & its Future Prospects”. He was explained in brief the Indian market Scenario for the EV. He illuminated the types of charging stations as Level 1 and Level 2 for the Electric vehicles and types of battery with their BMS Cell Balancing Functions. He also gave a brief about “ATHER ENERGY GAME CHANGER” available in India.

Speaker 2: Mr. Dhyeya Pandya
(Technical Officer ABZO Motors Pvt Ltd.)
Time: 11:30 am to 1:00 pm



meet.google.com/tjr-jqqy-dak

dhyyeya pandya is presenting

RAVAL KULDEEP and 11 more

11:51 AM

Fact:
A slok written by Muni Agastya in 4000 BC:

संस्थाप्य मृण्मये पात्रे ताम्रपत्रं सुसंस्कृतम्।
छादयच्छि विश्रीवेन चादीभिः काश्यापासुभिः ॥
दस्तालोशे निधात्वयः पारदाच्छादितस्ततः।
सयोगाज्जायते तेजो मित्रावरुणसंज्ञितम् ॥

Place a well-cleaned copper plate in an earthenware vessel. Cover it first by copper sulfate and then by moist sawdust. After that, put a mercury-amalgamated zinc sheet on top of the sawdust to avoid polarization. The contact will produce an energy known by the twin name of Mitra-Varuna. Water will be split by this current into Pranavayu and Udanavayu. A chain of one hundred jars is said to give a very effective force.

ABZO

2) History of Batteries

1748 Benjamin Franklin first coined the term "Battery".

1800 Alessandro Volta invented the first true electrochemical cell.

1859 First rechargeable Lead-acid battery developed.

1859-1860 Development of Ni-Cd, NiMH, Zinc battery chemistries.

1980 John Goodenough invents the Lithium-ion battery.

Metal Air Batteries
Solid State Batteries
Graphene Batteries
FES

Activate Windows
Go to Settings to activate Windows.
Nimesh Gajjar

meet.google.com/tjr-jqqy-dak

dhyyeya pandya is presenting

RAVAL KULDEEP and 11 more

11:54 AM

Distinguish between Li-ion chemistries

CHARACTERISTIC	LFP (LiFePO ₄)	NMC (LiNiMnCoO ₂)	LiCo (LiCoO ₂)	LMO (LiMn ₂ O ₄)	LTO (Li ₄ Ti ₅ O ₁₂)
Voltage	3.2VPC (operating range 2.5-3.65VPC)	3.6VPC (operating range 3-4.2VPC)	3.6VPC (operating range 3-4.2VPC)	3.7VPC (operating range 3-4.2VPC)	2.4VPC (operating range 1.8-2.85VPC)
Specific Energy	90-120 Wh/kg	150-220 Wh/kg	150-200 Wh/kg	100-150 Wh/kg	50-60 Wh/kg
Energy Density	333 Wh/l	580 Wh/l	560 Wh/l	420 Wh/l	177 Wh/l
Charge Rate	1C	0.7-1C (>1C shortens life)	0.7-1C (>1C shortens life)	0.7-1C (3C Max)	1C (5C Max)
Charge Voltage	3.5-3.65VFC	4.2VFC	4.2VPC	4.2VPC	2.85VFC
Discharge Rate	1C (30C power cells); 2.0V cut-off	1C (2C on some cells); 2.5V cut-off	1C (>1C shortens life); 2.5V cut-off	1C (>1C shortens life); 2.5V cut-off	10C (30C 5 sec); 1.8V cut-off
Cycle Life (depending on depth of discharge)	2000-4000	1000-2000	500-1000	300-700	3000-7000
Thermal Runaway	270°C (518°F)	210°C (410°F)	150°C (302°F)	250°C (482°F)	NA
Prone to Thermal Runaway	No	Yes	Yes	Yes	No
Applications	Motive power and stationary needing high currents and endurance	E-bikes, medical devices, EVs, industrial	Mobile phones, laptops, tablets, cameras	Power Tools, medical devices, electric powertrains	UPS, electric powertrains, solar street lighting
Cost	\$	\$	\$\$	\$\$	\$\$\$

ABZO

Activate Windows
Go to Settings to activate Windows.
Nimesh Gajjar

Mr. Dhyyeya Pandya shared his knowledge on Electric Mobility in India: Why? What? When? He started with "Component difference between ICE and EV". He was very well explained to the slok on the effective force, which written by "MUNI AGATSYA" in 4000 BC. After that, he explained the history of battery by "Benjamin Frankline" in 1748. He also shared his view on distinguishing battery on Li-ion chemistries with its characteristics.

Speaker 3: Prof. Sulay Patel
(Asst. Prof. L D College of Engineering)
Time: 1:30 pm to 3:00 pm

The screenshot shows a Google Meet interface with two slides. The first slide, 'Key Stages of EV Development', outlines three eras: Beginning (1801-1850), First Age (1851-1900), Boom and Bust (1901-1950), Second Age (1951-2000), and Third Age (2001-Present). The second slide, 'Electrification', compares Conventional, Hybrid, and Battery Electric vehicle powertrains.

Key Stages of EV Development

- Beginning 1801-1850:** The earliest electric vehicles were invented in Scotland and USA.
- First Age 1851-1900:** Electric vehicles enter the market and start to find broad appeal.
- Boom and Bust 1901-1950:** EVs reach historical peaks of production but are then displaced by petrol-engine cars.
- Second Age 1951-2000:** High oil prices and pollution created a new interest in electric vehicles.
- Third Age 2001-Present:** Public and private sectors now commit to vehicle electrification.

Electrification

The diagram illustrates three vehicle architectures:

- Conventional:** Fuel → Engine → Transmission → Axles.
- Hybrid:** Fuel and Battery → Engine/Motor Generator → Transmission → Axles.
- Battery Electric:** Battery → Motor/Generator → Transmission → Axles.

The screenshot shows a Google Meet interface with a slide titled 'Well-to-Wheels Efficiency'. The slide contains two diagrams comparing the energy flow from source to vehicle for an electric vehicle (top) and a conventional internal combustion engine vehicle (bottom). The source is cited as <http://www.nesae.org>.

Well-to-Wheels Efficiency

The top diagram shows the energy path for an electric vehicle: from a power plant through transmission lines to a charging station, and finally to the vehicle's battery. The bottom diagram shows the energy path for a conventional vehicle: from an oil well through refining and distribution to a gas station, and finally to the vehicle's engine.

Source: <http://www.nesae.org>

meet.google.com/tjr-jqay-dak?pli=1&authuser=1

REC S Sulay Patel is presenting

Chintan Barelwa... and 7 more

2:04 PM

Perspective on battery pack size in 80 mile EV

picture.zip

Show all

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ENG 02:04 PM 26-11-2020

Prof. Sulay Patel was explained on topic “Powertrain for Electric Vehicles”. He explained in Key stages of EV development from begging 1801 to 2000. He gave a brief about what we expected from the vehicle technologies in 2040. How we improve design and technology from the reduction of weight and drag to the transmission system, after that micro mild hybrid design to full hybrid to plug-in hybrid, and finally we expected as mass-market of EV to Fuel cell vehicles. He also explained Convectional, Hybrid and Battery electric vehicles designs he called as to Electrification. The EMs are connected to the wheels through reducer gear and driveshaft. He presented in his webinar to Perspective on battery pack size required for 80 miles EV in different companies like Ford, Fiat, Chevy, and Honda car design.

Gandhinagar Institute of Technol x picture - vipal.panchal@git.org.in x Meet - tjr-jqay-dak

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REC

Chintan Barelwa... is also here

18

2:28 PM

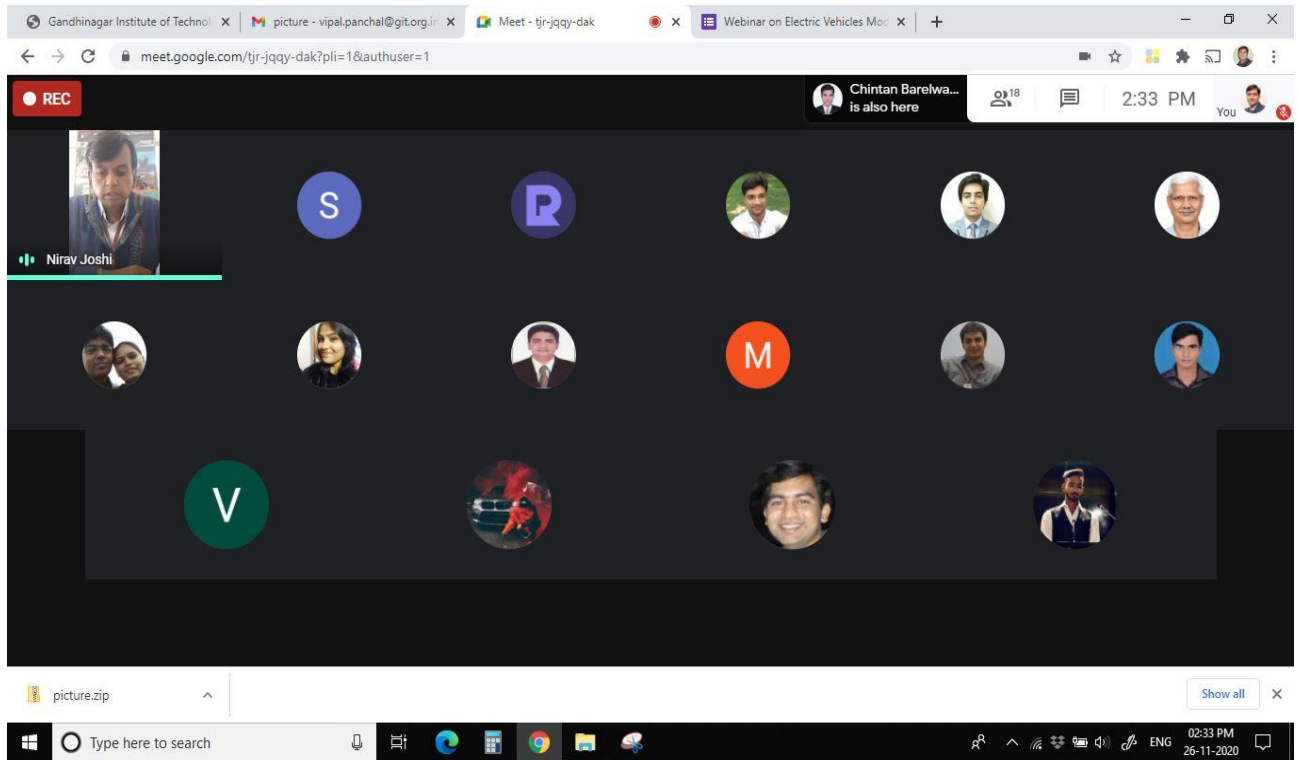
Sulay Patel

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ENG 02:28 PM 26-11-2020



Vote of Thanks:

Prof. Nirav Joshi (Head of Mechanical Engineering, Gandhinagar Institute of Technology)

At the end of the session, Prof. Nirav Joshi was given the Conclusion of the webinar on “Electric Vehicles Modelling and Future Adoption” Sponsored by GUJCOST and DST. He gave thanks to the all the experts Dr. Sudhir Gupte, Dr. Madhukant Patel, Dr. Suketu Jani, Mr. Dhyey Pandya, Prof. Sulay Patel & participants, director, sponsors, organizing committee and all staff members who made this event a grand success by spend their time in webinar to give knowledge about the specialization on Electric Vehicles and Future Adoption.

Acknowledgement:

The coordinating team and Mechanical Engineering Department is thankful to the Trustees and Director for their support for successful organizing this webinar. The Mechanical Engineering Department of Gandhinagar Institute of Technology is also grateful to GUJCOST and DST for the financial support to organize this webinar.