



BUILDERS ENGINEERING COLLEGE

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

ISO 9001:2015 Certified Institution & Accredited by NAAC with B++ Grade

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Department of Electrical & Electronics Engineering JUNE 2020



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About the Institution

Builders Engineering College (Formerly known as Erode Builder Educational Trust's Group of Institutions) was established by Erode Builder Educational Trust (EBET) in the year 2009 as an integrated campus and presently functioning as a technical campus. It offers six UG Programmes (BE – Civil, CSE, ECE, EEE, Mechanical) and four PG Programmes (ME – CEM, STR, CSE and MBA) with an intake of 114 students. Stepping into the fourteenth year of service, the Management, CEO, Principal and faculty members are committed to elevating the lives of budding rural aspirants through academics and research. The Chief Patrons are the pioneers in the field of infrastructure and construction all over India.

Vision

To be the most preferred knowledge provider.

Mission

Builders Engineering College endeavours to prepare rural students for successful career through academic and applied research.

About the Department

The Department of Electrical and Electronics Engineering was started in the year 2010 and offers BE EEE programme in tune with the syllabi of Anna University. The department aims to develop electrical engineers who are innovative, entrepreneurial, and equipped to become global leaders in research and technology. The department has well qualified faculty members who are specialists in the fields of Power Electronics and Drives, VLSI Design, Applied Electronics and Power Engineering and Management. The faculty team includes a doctorate serving for the betterment of the students. The department has well equipped laboratories. The department provides an environment to students in such a way that they will be able to understand the core concepts including Electrical machines, Circuits and Networks, Power systems, Power Electronics, Electromagnetic theory, Instrumentation, Microprocessors and Microcontrollers and Electron Devices & Circuits.

Vision

To become a front-runner in moulding the students globally competent, knowledgeable electrical engineers also as performers in the roles of innovators, researchers and entrepreneurs.

Mission

To nurture the students with sound technical knowledge to meet the upcoming challenges in electrical domain and to enhance competitiveness of the graduates for higher studies.

Programme Educational Objectives (PEOs)

- Shall flourish in their professional careers, further education, research, or as entrepreneurs
- Must always learn new things and hone existing abilities to create solutions that have a big impact and are cutting-edge in terms of energy use.
- To create and build practical, multidisciplinary solutions that are technically sound, commercially viable and socially acceptable, graduates must have strong communication skills, a professional demeanour and ethical behaviour.

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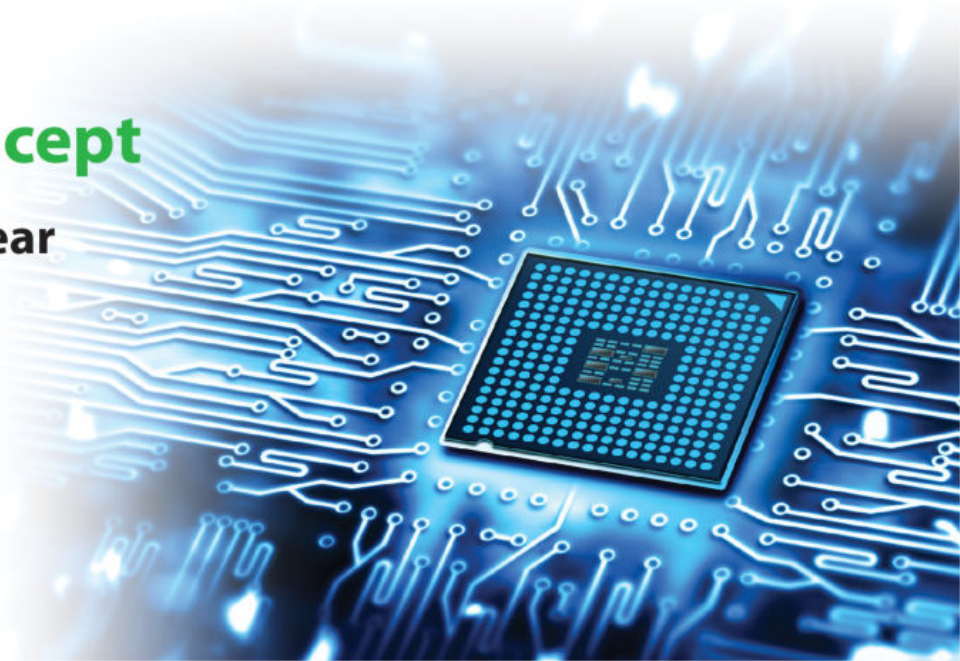
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Advancements in Battery Technology: Accelerating the Electric Vehicle Revolution

by Dr. R. Palanisamy, Associate Professor

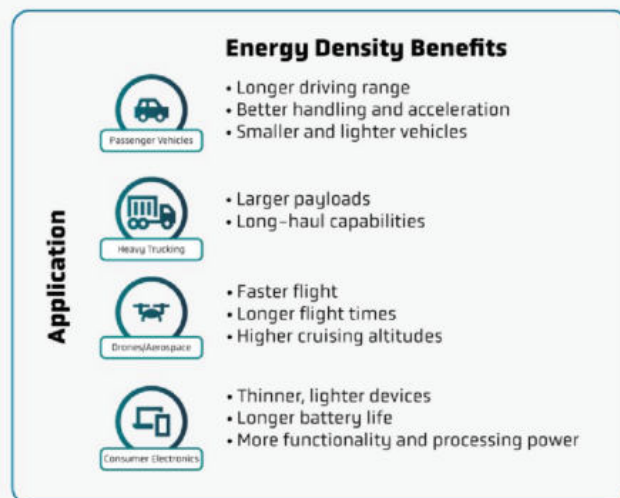
Introduction:

The proliferation of electric vehicles (EVs) represents a significant paradigm shift in transportation, with the potential to revolutionize the automotive industry and combat climate change. At the heart of this revolution lies battery technology, which continues to undergo rapid advancements aimed at enhancing energy density, reducing costs, and extending driving ranges. This article explores the latest breakthroughs in battery technology, highlighting their pivotal role in driving the widespread adoption of electric vehicles and ushering in a cleaner, greener future for transportation.

The Drive Towards Energy Density:

Energy density, or the amount of energy stored per unit volume or weight, is a critical metric for battery performance in electric vehicles. Advances in battery chemistry, materials science, and manufacturing processes have led to significant improvements in energy density, enabling EVs to achieve longer driving ranges on a single charge. Lithium-ion batteries, which dominate the EV market, have seen steady increases in energy density through innovations such as higher nickel content cathodes, silicon-based anodes, and solid-state electrolytes.

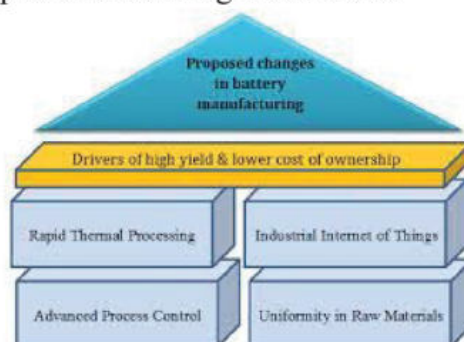
Moreover, next-generation battery technologies, including lithium-sulfur (Li-S), lithium-air (Li-Air), and solid-state batteries, promise even greater gains in energy density and performance. Li-S batteries, for example, offer higher theoretical energy densities than conventional lithium-ion batteries, potentially doubling the driving range of electric vehicles. Solid-state batteries, which replace the liquid electrolyte with a solid electrolyte, offer improved safety, longevity, and energy density, making them promising candidates for future EV applications.



Cost Reduction and Scalability:

While advancements in energy density are crucial for extending EV range, reducing battery costs remains a key challenge for mass adoption. The high cost of lithium-ion batteries, driven by raw material prices, manufacturing complexities, and limited production scale, has been a barrier to widespread EV adoption. However, concerted efforts by industry stakeholders, government initiatives, and technological innovations are driving down battery costs and improving manufacturing efficiencies.

Key strategies for cost reduction include optimizing battery chemistries, increasing production scale, and streamlining manufacturing processes. The transition to nickel-rich cathodes and the reduction of cobalt content in lithium-ion batteries have helped lower material costs and improve supply chain sustainability. Additionally, advancements in battery manufacturing technologies, such as continuous electrode fabrication, roll-to-roll processing, and automated assembly lines, are increasing production throughput and reducing labor costs.



Enhancing Durability and Performance:

In addition to energy density and cost, durability and performance are critical considerations for EV batteries. Battery degradation over time, commonly referred to as capacity fade, can impact driving range and longevity, leading to concerns about battery replacement costs and residual value. However, innovations in battery management systems (BMS), thermal management solutions, and predictive analytics are helping mitigate degradation effects and prolong battery life.

Active thermal management systems, such as liquid cooling and heating, help maintain optimal battery temperatures, reducing thermal stress and extending battery cycle life. Advanced BMS algorithms monitor cell voltages, temperatures, and state-of-charge in real-time, enabling precise control of charging and discharging processes to minimize degradation. Furthermore, predictive analytics and machine learning algorithms analyze battery performance data to identify degradation trends and optimize battery operation for maximum longevity.



Conclusion:

Advancements in battery technology are driving the electric vehicle revolution forward, enabling longer driving ranges, lower costs, and improved performance. From increases in energy density and scalability to reductions in cost and enhancements in durability, battery innovations are accelerating the transition to a sustainable transportation future. As research and development efforts continue to push the boundaries of battery technology, the electrification of vehicles will play an increasingly central role in reducing greenhouse gas emissions,

enhancing energy security, and reshaping the automotive industry.

Powering Tomorrow: Innovations in Electrical and Electronics Engineering

by **G. Naveen Kumar, III Year**

In the dynamic realm of electrical and electronics engineering, innovation is the driving force behind transformative changes that shape our world. From revolutionizing energy systems to advancing communication networks, the field continues to push boundaries, unlocking new possibilities and powering the future.

Electrifying Energy Solutions:

One of the most significant areas of innovation in electrical engineering lies in energy solutions. With a growing emphasis on sustainability and reducing carbon emissions, engineers are developing groundbreaking technologies to harness renewable energy sources such as solar, wind, and hydroelectric power. Advancements in photovoltaic cells, wind turbine design, and energy storage systems are enhancing efficiency and reliability, paving the way for a cleaner and more sustainable energy future.



Smart Grids and Energy Management:

The integration of smart grid technology is revolutionizing the way we manage and distribute electricity. By leveraging advanced sensors, communication networks, and data analytics,

engineers are developing intelligent grid systems that optimize energy usage, improve reliability, and accommodate the increasing penetration of renewable energy sources. Smart grids enable real-time monitoring and control of energy flows, facilitating more efficient resource allocation and reducing the likelihood of power outages.

Connected World: Internet of Things (IoT) and Communication Networks

In the realm of electronics engineering, the proliferation of the Internet of Things (IoT) is reshaping how devices communicate and interact with each other. Engineers are developing interconnected systems that enable seamless communication between sensors, actuators, and computing devices, leading to a wide range of applications in healthcare, transportation, manufacturing, and beyond. These IoT-enabled solutions are driving efficiency, automation, and connectivity, ushering in an era of unprecedented technological integration and innovation.

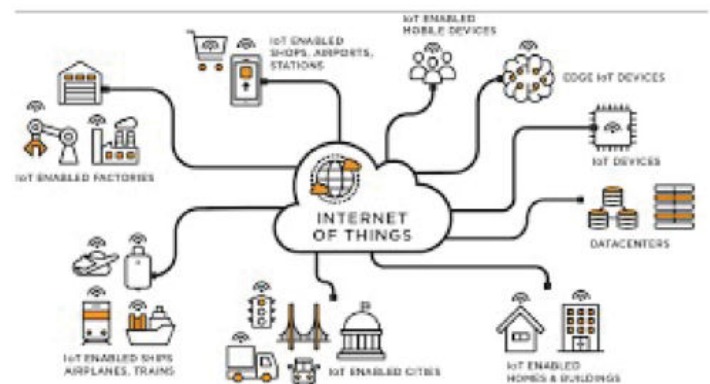
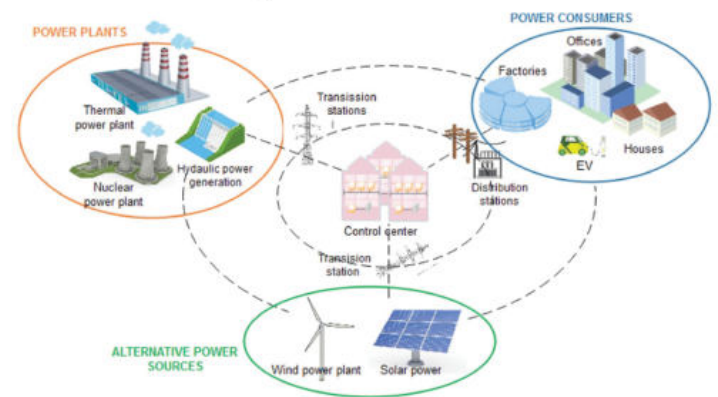


Semiconductor Advancements and Beyond:

Semiconductor technology continues to evolve at a rapid pace, enabling the development of smaller, faster, and more energy-efficient electronic devices. Engineers are pushing the limits of miniaturization, exploring novel materials and fabrication techniques to enhance the performance of integrated circuits and semiconductor devices. From cutting-edge processors to advanced memory storage solutions, these innovations are fueling the development of next-generation electronics, powering everything from smartphones and laptops to autonomous vehicles and artificial intelligence systems.

Challenges and Opportunities Ahead:

While the field of electrical and electronics engineering holds immense promise for the future, it also faces significant challenges. The transition to renewable energy sources requires overcoming technical, economic, and regulatory hurdles, while the proliferation of IoT devices raises concerns about cybersecurity and data privacy. Engineers must also address the growing demand for energy-efficient electronics and sustainable manufacturing practices to minimize the environmental impact of electronic waste.



conclusion

The innovations in electrical and electronics engineering are driving profound transformations across industries and society as a whole. From sustainable energy solutions to interconnected smart systems, the field is powering tomorrow's world with creativity, ingenuity, and a relentless pursuit of progress. As we continue to push the boundaries of what is possible, the future of electrical and electronics engineering holds limitless potential to shape a brighter, more connected, and sustainable tomorrow.

Advanced Special Machines: Innovations and Applications in Modern Industries

by S. Janani, III Year

Introduction:

Special machines, also known as special purpose machines (SPMs), play a crucial role in modern industries by offering customized solutions to specific manufacturing challenges. These advanced machines are designed and engineered to perform specialized tasks with precision, efficiency, and reliability. In this article, we explore the latest innovations and applications of advanced special machines across various industries, highlighting their significance in driving productivity, quality, and innovation.

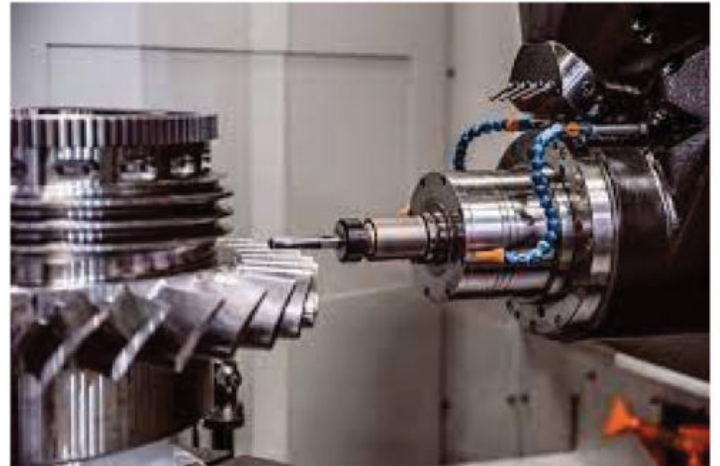
Advanced Automation and Robotics:

One of the key areas of innovation in special machines is advanced automation and robotics. Manufacturers are increasingly integrating robotic systems into their production lines to automate repetitive tasks, increase throughput, and improve process consistency. Collaborative robots (cobots) equipped with advanced sensors and artificial intelligence (AI) algorithms are revolutionizing manufacturing operations by working alongside human operators in a safe and efficient manner. These specialized robotic systems are capable of performing intricate assembly, pick-and-place, and material handling tasks with high precision and flexibility.



Precision Machining and Manufacturing:

Special machines are indispensable in precision machining and manufacturing applications where tight tolerances and high-quality standards are paramount. Advanced CNC (Computer Numerical Control) machining centers equipped with multi-axis capabilities and adaptive control systems enable the production of complex components with exceptional accuracy and surface finish. In addition, specialized machining centers tailored for specific materials such as composites, ceramics, and exotic alloys are pushing the boundaries of manufacturing capabilities, opening new possibilities in aerospace, automotive, and medical industries.



Additive Manufacturing and 3D Printing:

The emergence of additive manufacturing technologies, including 3D printing, has revolutionized the production of complex geometries and customized components. Special machines equipped with additive manufacturing capabilities enable the layer-by-layer deposition of materials to create intricate parts with minimal material waste. These advanced manufacturing systems are being used in various industries, including aerospace, healthcare, and automotive, to produce lightweight structures, prototypes, and patient-specific medical implants with unprecedented design freedom and customization.

Flexible Production Systems:

In today's fast-paced and dynamic manufacturing environment, flexibility is a key requirement for

staying competitive. Advanced special machines equipped with modular tooling, quick-changeover features, and adaptive control systems enable manufacturers to rapidly reconfigure production lines and adapt to changing market demands. Flexible manufacturing cells and systems, incorporating robotics, vision systems, and IoT (Internet of Things) connectivity, empower manufacturers to achieve high-mix, low-volume production with efficiency and agility.



Industry-Specific Applications:

Special machines find diverse applications across a wide range of industries, each with unique requirements and challenges. In the automotive sector, specialized assembly and testing machines ensure the quality and reliability of vehicle components, while in the pharmaceutical industry, precision filling and packaging machines enable efficient production of dosage forms and drug delivery systems. In the food and beverage industry, custom-designed processing and packaging machines optimize productivity and



hygiene standards, ensuring product integrity and compliance with regulatory requirements.

Conclusion:

Advanced special machines continue to drive innovation and transformation across modern industries, offering tailored solutions to complex manufacturing challenges. From precision machining and additive manufacturing to flexible automation and industry-specific applications, these advanced machines play a crucial role in enhancing productivity, quality, and competitiveness. As technology advances and market demands evolve, the role of special
