

Report of Industrial Visit to Delhi Technological University

Date: 25th September 2024

Venue: Delhi Technological University (DTU)

1. Introduction

On 25th September 2024, team of 31 students accompanied by esteemed teachers Dr. Shaily Malik, Ms. Gunjan Beniwal and Ms. Vaani Garg, visited advanced research labs at Delhi Technological University (DTU). DTU is a prominent institute known for its contributions to technological advancements in India. This visit was organized to give students a comprehensive understanding of cutting-edge research in Electric Vehicle (EV) technology, biodiesel production, and entrepreneurial incubation. The aim was to deepen our understanding of how research and innovation are driving technological developments in these fields.

Throughout the visit, teachers provided immense support and guidance, ensuring that students has made the most out of the opportunity. All were warmly welcomed by the faculty and staff at DTU, who were generous with their time and knowledge, allowing us to ask questions and gain insights. Refreshments were also provided, adding a personal touch to the experience.



2. Labs Visited

During this visit, students explored three major labs that are integral to DTU's research infrastructure, each focusing on different aspects of sustainable technologies and innovation.

2.1 Electric Vehicles and Related Technologies Lab (CoE for EVRT)

The **Centre of Excellence for Electric Vehicles and Related Technologies** (CoE for EVRT) is one of the most important labs at DTU, focusing on research and training in the growing field of Electric Vehicles. The lab's primary focus is to contribute towards making electric mobility more efficient and accessible. Key highlights of the lab include:

- **Research Areas:** The lab conducts extensive research in areas like electric propulsion systems, battery technologies, and energy optimization, all of which are critical for the future of sustainable transportation.
- **Student Involvement:** The lab allows students and researchers to work on practical projects, providing hands-on experience that complements their academic learning.
- **Collaborations:** National and international collaborations with other academic and industry leaders drive the innovation in electric vehicle technology, further boosting research outputs.
- **Sustainability:** The development of electric vehicles is crucial for reducing carbon emissions, making this lab's work pivotal for combating climate change.

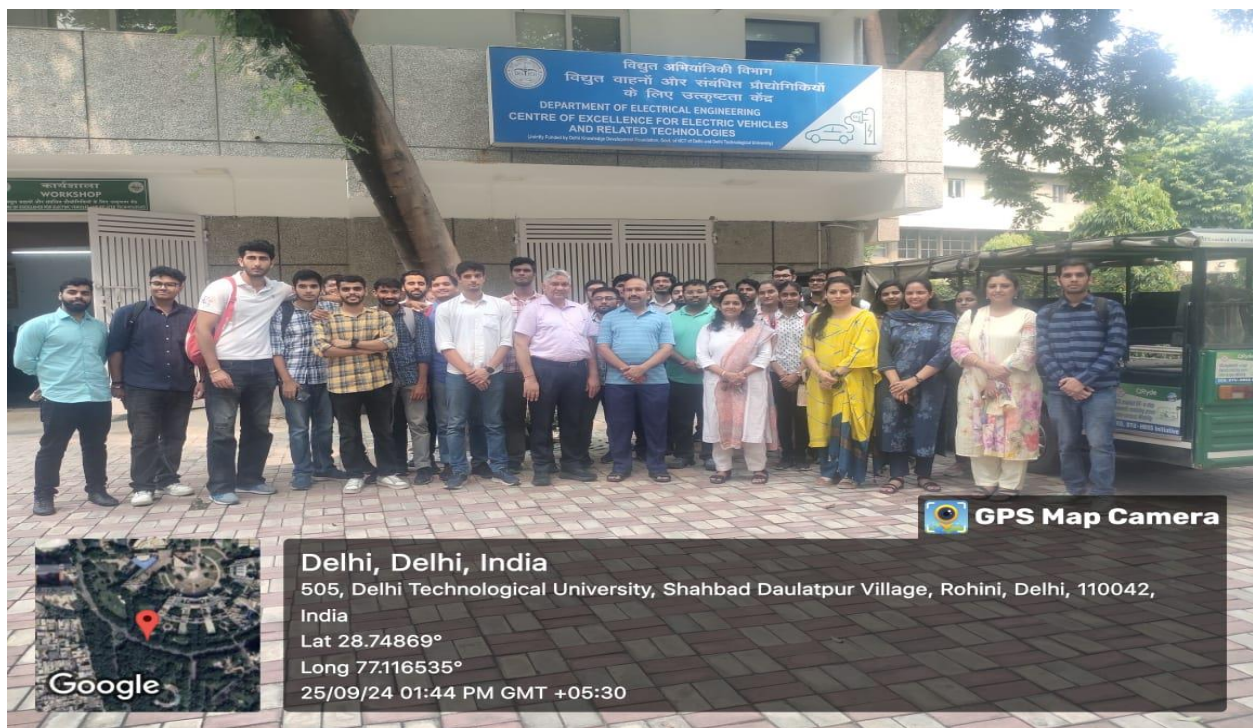
Visit to the CoE for EVRT gave students valuable insights into the current state of electric vehicle technology and its potential to revolutionize transportation.

Here are some additional points about the **Electric Vehicles and Related Technologies Lab (CoE for EVRT)** at DTU:

- **Battery Innovation and Energy Storage Research:** The lab conducts extensive research on improving battery technology, focusing on lithium-ion, solid-state, and other advanced battery systems. The goal is to increase energy density, enhance charging speed, and improve the overall lifespan of batteries used in electric vehicles.
- **Electric Drivetrain Development:** The lab works on the optimization of electric drivetrains, focusing on improving the efficiency of electric motors, power electronics, and transmission systems. This research helps reduce energy losses and improve vehicle performance.
- **Power Electronics and Control Systems:** The lab explores innovations in power electronics, particularly in converters and inverters that manage the power flow between the battery, motor, and other vehicle systems. Advanced control algorithms are developed to optimize energy usage and performance in real-time.
- **Fast Charging and Infrastructure:** In addition to vehicle-specific research, the lab is also involved in developing fast charging technologies and the required infrastructure. This includes work on high-power charging stations that can significantly reduce charging times for EVs.

- **Vehicle-to-Grid (V2G) Technology:** Research is being conducted on Vehicle-to-Grid (V2G) technology, where electric vehicles can supply energy back to the grid when not in use. This helps in energy balancing and contributes to smart grid solutions.
- **Autonomous Electric Vehicles:** The lab is working on projects related to autonomous electric vehicles, developing advanced sensor systems, control algorithms, and AI-driven navigation solutions that can be integrated into future EVs.

These points further emphasize the lab's comprehensive approach toward advancing electric vehicle technology, not only through vehicle-specific improvements but also by focusing on infrastructure, energy management, and future transport systems.



2.2 Biodiesel Research Lab

The **Biodiesel Research Lab** at DTU is a leading center for research in alternative fuels, especially biodiesel. This lab has played a key role in developing sustainable solutions that could replace traditional fossil fuels. Some of the main achievements of the lab include:

- **Biodiesel Production Capacity:** The lab is equipped with production units capable of producing between 5 liters and 5,000 liters of biodiesel per day. This demonstrates the versatility of the lab in both research and commercial production.

- **Innovative Technologies:** The lab is focused on researching heterogeneous catalysts and supercritical biodiesel production methods, which have the potential to improve the efficiency and cost-effectiveness of biodiesel.
- **Projects and Collaborations:** The lab has been involved in several national and international research projects, such as:
 - A collaboration with **Yanmar Co. Ltd., Japan**, focusing on testing biodiesel-fueled engines for durability and performance.
 - An **Indo-Spanish research project** in collaboration with the University of Murcia, Spain, aimed at developing supercritical technologies for biodiesel synthesis.
- **Vehicle Testing:** Vehicles such as the Maruti Zen and Tata Indica have undergone successful trials using biodiesel blends (e.g., B20). These tests have demonstrated biodiesel's potential as a reliable and sustainable alternative to conventional diesel.



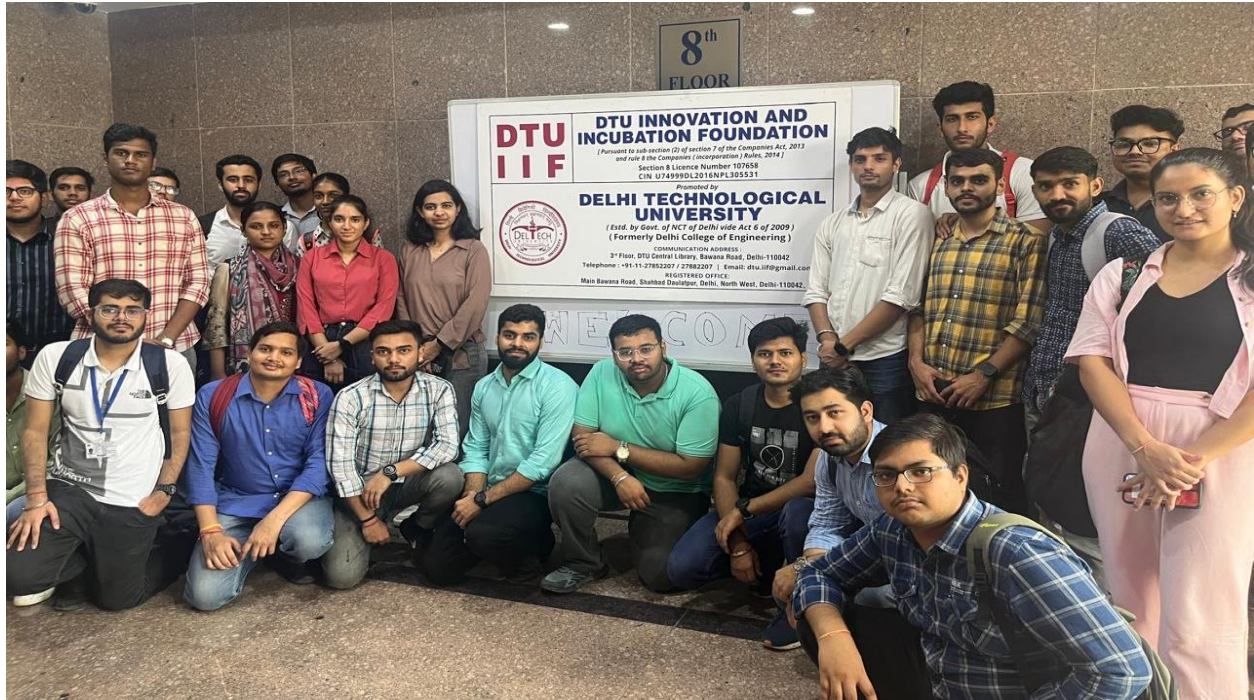
2.3 DTU-Incubation and Innovation Foundation

The **DTU-Incubation and Innovation Foundation (DTU-IIF)** is an incubator dedicated to fostering entrepreneurship and innovation among students and researchers. This foundation provides a dynamic platform for startups to grow and thrive. The key features of the foundation include:

- **Support for Startups:** DTU-IIF offers mentorship, financial assistance, and a conducive environment for turning innovative ideas into successful businesses.
- **Innovation Hub:** The foundation serves as a creative space where students can work on groundbreaking projects, helping them commercialize their research.

- **Industry Partnerships:** Through its strong industry linkages, DTU-IIF enables startups to collaborate with established organizations, providing them with valuable market insights and resources to scale their businesses.

Several startups incubated at DTU-IIF are working on cutting-edge technologies in areas like artificial intelligence, clean energy, and sustainable transportation. This visit gave us a glimpse into how young innovators are using their skills to address pressing global challenges through entrepreneurship.



3. Key Takeaways

Visit to DTU's labs provided us with several key insights:

- **Exposure to Cutting-Edge Technologies:** Students gained a firsthand understanding of the latest research in electric vehicles and biodiesel production. The hands-on experience provided us with a deeper appreciation of how these technologies are developed and refined.
- **Focus on Sustainability:** The recurring theme across all the labs we visited was the emphasis on sustainability. Whether through electric vehicles or alternative fuels like biodiesel, DTU is contributing to the global push for cleaner, greener technologies.
- **Entrepreneurship and Innovation:** The DTU-Incubation and Innovation Foundation showcased the importance of entrepreneurship in modern-day research. The platform it provides for young innovators to turn their ideas into businesses is inspiring, and it encouraged us to think about how we could leverage technology to solve real-world

problems. Practical Application of Classroom Knowledge: The visit demonstrated how theoretical concepts learned in the classroom, such as electric propulsion systems and renewable energy, are applied in real-world research and innovation. Seeing these technologies in action provided a deeper understanding of their significance and potential impact.

- Exposure to Cutting-Edge Research: We were exposed to advanced research being conducted in electric vehicle technology and alternative fuels, particularly biodiesel. The labs at DTU are working on the latest advancements in these areas, showing us how research and development are crucial in pushing the boundaries of technology.
- Hands-On Learning Opportunities: The visit provided us with the chance to observe ongoing experiments and live demonstrations of technologies in electric vehicles, battery systems, and biodiesel production. Such exposure helped bridge the gap between theory and practice.
- Interdisciplinary Approach: A notable takeaway was the interdisciplinary nature of the research. The projects we observed combined knowledge from various fields, including mechanical engineering, electrical engineering, chemistry, and environmental science, showcasing the importance of collaborative work in solving complex problems.
- Focus on Sustainable Technologies: Sustainability was a core theme throughout the visit. The work being done at DTU in electric vehicles, biodiesel production, and renewable energy integration emphasized the importance of developing eco-friendly technologies to address global challenges such as climate change, resource depletion, and pollution.
- Global Impact and Collaboration: DTU's involvement in numerous national and international research collaborations highlighted the global scale of their projects. From partnerships with Japanese and Spanish institutions to contributions to the Indian government's renewable energy initiatives, it became clear that global cooperation is essential for tackling technological and environmental challenges.
- Innovation in Energy Efficiency: The visit reinforced the importance of energy efficiency in modern technologies. Whether through electric vehicle advancements or more efficient biodiesel production methods, the labs are working to optimize energy use, which is critical for both sustainability and economic viability.
- Entrepreneurial Inspiration: The DTU-Incubation and Innovation Foundation demonstrated how academic research can lead to successful startups. Seeing real-world examples of student-led startups provided inspiration for future entrepreneurial pursuits, showing us the potential of turning innovative ideas into businesses that can solve real-world problems.
- Real-World Problem Solving: A strong takeaway was the problem-solving mindset ingrained in all the labs. The focus was not just on theoretical innovation but on developing practical, scalable solutions to real-world problems, such as reducing emissions, improving vehicle efficiency, and creating alternative fuel sources.

- **Technological Innovation for Societal Benefit:** The visit demonstrated how technological advancements can be directly applied to solve societal issues. Research on electric vehicles (EVs) and biodiesel not only contributes to cleaner transportation but also promotes energy security and economic sustainability by reducing dependence on fossil fuels.
- **Hospitality and Refreshments**

Teachers, Dr. Shaily Malik, Ms. Gunjan Beniwal, Ms., and Ms. Vaani Garg, ensured that students were fully prepared for the visit and guided us throughout. The faculty and staff at DTU were incredibly welcoming and went out of their way to ensure that we had a fulfilling experience. The provision of refreshments allowed us to relax and interact with the researchers in a more informal setting, making the visit not only educational but also enjoyable.

5. Conclusion

In conclusion, the industrial visit to Delhi Technological University was a remarkable learning experience that broadened students understanding of various technologies and their real-world applications. With guidance from teachers and the hospitality of the DTU staff, students gained insights into how advanced research in electric vehicles, biodiesel, and entrepreneurship is shaping the future of technology.

The visit not only gave students a deeper understanding of these fields but also inspired us to think critically about the challenges we might face in the future and how we can contribute to solving them. We look forward to applying the knowledge and insights gained from this visit to our academic studies and future careers.

The attached photos showcase the advanced labs and activities students participated in during the visit, providing a visual representation of the groundbreaking work being done at DTU. These images capture the spirit of innovation that pervades the university, further enhancing the impact of our industrial visit.

This report is an effort to summarize a visit to DTU, highlighting the valuable lessons and experiences gained during this educational and eye-opening industrial visit.



