



CENTRE FOR ADVANCED STUDIES AND RESEARCH IN AUTOMOTIVE ENGINEERING

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DELHI TECHNOLOGICAL UNIVERSITY

Govt. of NCT of Delhi
(Formerly Delhi College of Engineering)

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Delhi Technological University (Formerly Delhi College of Engineering) has a chequered history of more than 75 years and has emerged as a leading research institution in automotive research not only in India but at international level as well.

Fossil fuels such as coal and petroleum have been the energy sources of the world for centuries. However, in the third millennium, there has been a growing recognition of the dangers inherent in continuing with indiscriminate consumption of fossil fuels for more than one reason. Of late, world opinion has been growing in favor of looking for alternatives to fossil fuels that would ensure eco-friendly and sustainable development on one hand and energy security on the other.

The broad goal of the Government of India under “Energy for All” assumes an increasing role for renewables and Euro VI norms by 2020 focusses on clean combustion. Under the influence of programs of the UN Framework Convention on Climate Change (UNFCCC) and the Paris Summit, there is an urgent need to promote renewable energy technology and clean combustion for sustainable development. Centre for Advanced Studies & Research in Automotive Engineering established by Delhi College of Engineering now Delhi Technological University in 2003, has made a great stride in the area of alternative fuels, renewable energy, and new engine technology and has a distinctive position on a global level.

Objectives

The Centre for Advanced Studies & Research in Automotive Engineering was established with an objective to develop alternate renewable sources of energy for power generation and to explore liquid & gaseous fuels for utilization in SI & CI engines such as ethanol, biodiesel, butanol, CNG, hydrogen, and DME. The Centre has its own cultivation of oilseed bearing plants such as Jatropha and Karanja and also

carries out a genetic modification for higher yield. The development of efficient oil seed extraction technology is also carried at the Centre. In line with an adaptation of Euro VI norms in India, emissions reduction from a variety of engines is also actively pursued.

The Centre also organizes mass awareness and specialized training programs and the main objective lies in the transfer of technology from academia to industry. One of the major highlights of this commitment is a sponsored research project carried in synergy with Yanmar Co. Ltd., Osaka, Japan.



Cultivation of Biodiesel Plant

The Centre has the required infrastructure to produce 10,000 liters of biodiesel from its own cultivation of Jatropha and Pongamia. A high yielding nursery of Jatropha and Pongamia is also developed by the Centre.



Biodiesel Training Programs

The Centre is committed towards popularization of biofuel production technology in India and especially in the rural areas. The biodiesel training programme for farmers, rural entrepreneurs, a self-help group of women and ex. defense personnel was organized during 2004-2005 to empower them as well as to provide them with an opportunity for better livelihood and employment. The Petroleum Conservation and Research Association (PCRA) was a key partner in these training programmes.



Processing Units

The Centre carried out the development of Biodiesel processing units with production capacities ranging from 5 liters per batch to 5000 liters per day based upon homogenized catalyzed technology. A 600 liters per day biodiesel production under Ministry of New & Renewable Energy (MNRE) Sponsored Project “Development of an efficient biodiesel reactor for rural application and utilization of multi-feedstock derived biodiesel in a medium capacity diesel engine” was developed by the Centre in 2006.

The Centre expanded its horizon further by commissioning a high capacity biodiesel unit (5000 liters per day) as a part of Petroleum Conservation Research Association (PCRA) Sponsored Project “Development & process optimization of a medium capacity state of art biodiesel processing unit” in 2008. This is the biggest unit amongst any educational institution in India and has attracted many industries for transfer of technology.



Super Critical Transesterification Reactor

The Centre has also been a part of Indo-Spanish Collaborative Research Project “Application of supercritical technology for the synthesis of biodiesel from non-edible oils (*Jatropha curcas* and *Pongamia pinnata*) using heterogeneous catalysts” with the University of Murcia, Murcia, Spain. The faculty and the students from the Centre and the University of Murcia visited partnering institutions and a supercritical transesterification reactor developed to accelerate the production process of biodiesel of non-edible origin.



Development of Ultra-Shear Reactor

The Centre also worked with Kreido Biofuels, California, USA to develop indigenous ultra-shear biofuel production technology which would substantially reduce the reaction time.

Fences for Fuel

The Centre provided consultancy in World Bank Funded Project “Fences for Fuel”. The Consultancy Work included setting up *Jatropha* cultivation at the fences of the field of farmers of Viratnagar Block in Jaipur District and commissioning of *Jatropha* oil extraction as well as of biodiesel production unit. The Development of cooking stove running on neat *Jatropha* oil/ biodiesel was also carried out during the project.



Biodiesel Specific Engine

Yanmar Co. Ltd., Osaka, Japan, funded project Performance & Endurance Tests on a Yanmar 10 KW diesel Generator set fuelled with neat biodiesel (B100) successfully completed at the Centre. During this project, a Yanmar 10 kW diesel engine was run for 6,500 hours on neat jatropha biodiesel to evaluate the suitability of B100 application in a diesel engine. The project was very unique and the Yanmar Co. Ltd. provided the engine and whole instrumentation for the exhaustive trial. The trial data were transferred to R&D Centre of Yanmar Co. Ltd. at Osaka online.



Biodiesel Vehicles

The Centre carried out exhaustive performance, emission and tribological studies on a Maruti Zen diesel car which was provided by Maruti Udyog Limited. A 20,000 km trial was completed during 2004-07 with B20 and the results were very encouraging.

Biodiesel Vehicle of the institution was flagged off by Smt. Sheila Dikshit, Former Chief Minister of Delhi on November 1, 2004.



PEM Fuel Cell

The students developed an indigenous PEM fuel cell and further refinement is in progress. The fuel cell developed was very innovative and resulted in ASME and SAE publication.

Waste Plastic into Liquid Fuel

The Centre is also developing technology to convert waste plastic into liquid fuel for use in a variety of engines. The students have developed a lab scale reactor and now working on its commercialization.

Participation in Exhibitions

The students and faculty carrying out research at the Centre regularly visit Exhibition, Workshop, Fairs etc with biodiesel reactors, samples of biodiesel and other exhibits/educational material for interacting and disseminating information to farmers and small & rural entrepreneurs about the opportunities in this vital sector.



Research Facilities

The Centre has state of the art analytical facilities to determine physico-chemical properties of a variety of liquid/gaseous fuels in accordance with ASTM norms. The facilities include evaluation of kinematic viscosity, density, specific gravity, calorific value, flash point, cloud & pour point, CFPP, CHNSO, carbon residue, copper strip corrosion, oxidation stability amongst many others. The Centre has a Gas chromatograph and ion chromatography as well. The growing concern for the tribological studies is well addressed by the Centre and there are adequate infrastructural facilities to carry out wear metal analysis of lubricating oil from a variety of engines which helps in preventive maintenance.



Engine Trial & Tribological Studies

The Centre is carrying out research on the use of alternative fuels in a variety of on-road and off-road engines. The Centre has a variety of, gasoline/diesel engines, emission measuring and allied equipment for comprehensive engine trials.



Next-Gen Biofuels

Research on next-gen biofuels is extensively carried at the Centre and a Photo-bioreactor has already been developed. The faculty and the students are carrying out research to develop improved oil extraction technology from algae and are also trying to produce H₂ from algal biomass. The initial work on the development of fungi biofuels has also been carried at the Centre.

Nanoparticles Doped Biofuel

Research is extensively carried out by researchers at the Centre to develop and use nanoparticles in biodiesel fuel for performance enhancement and emission reduction.

Ethanol & Higher Alcohols

The students are also carrying out exhaustive studies to use higher alcohols such as butanol, octanol, decanol etc in Spark and Compression Ignition engines in addition to the ethanol. The work on binary and ternary fuel blends consisting of diesel, biodiesel and higher alcohols are actively pursued. The development and use of surfactants for making stable emulsions are also a key area of research.

Heterogeneous and Nano Catalysts

Most of the biofuel production worldwide has been done using homogeneous catalysts which have some inherent limitations. The Centre is developing heterogeneous and nanocatalysts for accelerating the reaction and to achieve higher biofuel yield.

Biomass Gasifier

A biomass gasifier has also been commissioned at the Centre for producing power from the biomass collected on the campus.



Green Diesel

The biodiesel produced from a variety of vegetable oils or animal fat has some deterrents and the researchers at the Centre are now working on producing green diesel using hydrotreating of solid and liquid biomass, which shall have better properties than biodiesel.

Compressed Air Vehicle

The students at the Centre have developed a Compressed Air Engine and now they are working on commercialization of the technology along with the development of a vehicle which could run on compressed air.

Solar Powered Multi-Utility Vehicle

The students are building solar-powered multi-utility vehicle equipped with the dual-axis solar tracker. The main objective of this project is to develop vehicles with zero emissions.

Dual Fuel Engines

Dual fuel engines are recent advancements in the engine technology wherein, two fuels are used simultaneously for performance enhancement and emission reduction. The Centre has to its credit a dual engine which has been developed by students.

HCCI Engines

Homogeneous Charge Compression Ignition (HCCI) engine is the latest technology which results in a reduction in peak temperature of the combustion chamber with a view of NO_x reduction. The technology helps in lean combustion which results in fuel economy.



NO_x Reduction Using Selective Catalytic Reduction (SCR)

The center is developing SCR technology keeping in view of upcoming Euro VI norms. SCR is an afterburning technique which uses various catalysts for significant NO_x reduction along with other emissions.

Studies on Storage Stability of Biodiesel

The students at the center are working on the evaluation of different additives for enhancing the oxidation and long-term storage stability. Studies are also in progress to identify catalyst which can improve cold flow property of biodiesel.

Hydrogen Boosted Engines

The Centre has also developed technology for hydrogen use and its boosting in variety of engines for performance enhancement and emission reduction.

E-Vehicles

The Centre is also carrying out projects on development of two-wheeler or four-wheeler e-vehicles for mitigating climate change.

International Conferences

The Centre was instrumental in organizing 1st International Conference on “New Frontiers in Biofuels” from January 18-19, 2010 at India Habitat Centre, Lodhi Road, New Delhi.

The Centre provided technical support to the Vth International Symposium on Fusion of Science & Technology (ISFT-2016) which was held in New Delhi from January 18-22, 2016. And it also supported International Conference on New Frontiers in Engineering, Science & Technology (NFEST-2018) held in New Delhi, India from January 8-12, 2018. 21 Keynote Speakers and more than 500 delegates from 22 countries across six continents attended the conference.



Invited Lectures

The Centre invites prominent people from the industry to enlighten students with the recent advancements and trends.



Workshop Organised

A two days' workshop on "Recent Trends in Diesel Engine Technology" was organized by the students of the Centre from October 7-8 2017 for the students of Mechanical and Automotive Engineering department and other students having a keen interest in Diesel engine technology.

The Centre also assisted in organizing Workshop on "Alternative Fuels and Engine Tribology" from July 10-11, 2017.



Publications

Students and faculty members are involved in advanced level research of different facets of biofuels and publishing highly acclaimed research papers not only in Scopus Indexed Journals but also in SCI journals. 90+ peer-reviewed research publications are made by students and faculty (35+ SCI, 55+ Scopus Indexed) in the last eight years.

Quizzes

The Centre is organizing quizzes and other related events in association with IMechE for enhancing the knowledge of the students in the area of alternative fuels, renewable energy, internal combustion engines and emerging technologies.



Speak Out For Engineering (SOFE)

The Centre conducts “Speak Out For Engineering” in association with IMechE for collecting and bringing in new ideas and concepts in the field of research of alternative fuels, international combustion engines and other emerging technologies.

Linkages with other Research Organizations

The Centre has close linkages with leading Indian and International Research Organizations, Universities and industries e.g. Petroleum Conservation Reservation Association (PCRA), National Research Development Corporation (NRDC), Defence Research Development Organisation (DRDO), Department of Science & Technology (DST) and Ministry of New and Renewable Energy in India and University of Minnesota, University of South Florida, University of Murcia, Kongju National University, Korea Institute of Energy Research, Yonsei University, National Research Institute for Chemical Technology, Materials & Energy Research Centre and Babol Noshirvani University of Technology in different countries.

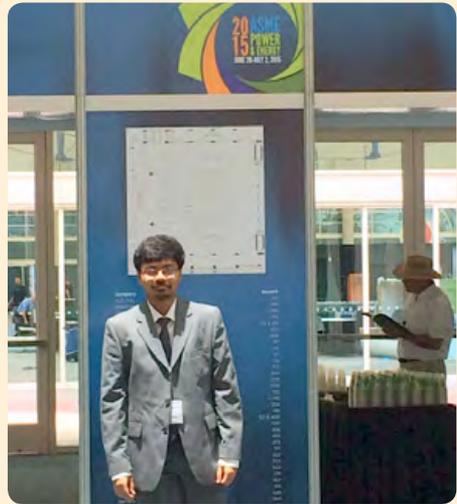
Participation in International Conferences (Abroad)

The students at the Centre are very vibrant and enthusiastic about sharing their knowledge & expertise and attend international conferences abroad to enrich their skills and broaden their horizon. They have presented research papers in various reputed international conferences and Symposiums:

1. Anshul Singla and Shivani Pande, European Energy Conference, Barcelona, Spain, April 2010
2. Vismit Bansal and Shaswat Anand, 3rd International Conference on Production, Energy and Reliability, Kuala Lumpur, Malaysia, June 2012
3. Vipul Vibhanshu, Ashish Kumar, Singh, V. Manish and Sahil Gupta, SAE World Congress, Detroit, USA, April 2013
4. Manas Chitransh and Utsav Banka, The World Congress on Engineering 2013, London, U.K., July 2013



5. Anuj Pal and Raghavendra Gautam, SAE Conference on Engines & Vehicles, Napoli, Italy, September 2013
6. Dhruv Gupta, ASME Internal Combustion Engine Fall (ICEF) Technical Conference, Dearborn, Michigan, USA, October 2013
7. Dhruv Gupta and Amarjot Singh, SAE Powertrain, Fuels and Lubricants Conference, Seoul, Korea, October 2013
8. Jitesh Singh Patel and Vasu Kumar, SAE World Congress, Detroit, USA, April 2014
9. Nadeem Yamin and Nishant Mohan, SAE Commercial Vehicle Conference, Rosemont, Illinois, USA, October 2014
10. Samarth Jain, Abhishek Aggarwal and Ashish Kr. Singh, 4th International Symposium on Fusion Technology, Raj Mangla University of Technology, Thailand, January 2015
11. Samarth Jain and Soumya Roy, ASME Power and Energy Conference, San Diego, USA, June 2015
12. Monis Alam, SAE World Congress, Detroit, USA, April 2017
13. Mukul Tomar and Rohan Brella, SAE World Congress, Detroit, USA, April 2018



Internship Abroad

The exemplary innovative research carried out by the students at the Centre has been acknowledged by the Academia & Industry at International level. The students were provided with International opportunities to carry out their research at the global level.



1. Arjun Khurana, Yanmar Co. Ltd., Japan, June-August 2007
2. Arjun Khurana, University of Paris, France, January-February 2008
3. Vijyesh Narula, University of Colorado, USA, June-August 2009
4. Anshul Singla, Yanmar Co. Ltd., Kota Kinabalu, Malaysia, June/July 2009
5. Dhruv Gupta and Abhishek Sharma, University of Murcia, Spain, June-July 2013
6. Dhruv Gupta, Vasu Kumar and Abhishek Sharma, University of Murcia, Spain, December 2013/January 2014
7. Ashray Gupta, Seoul National University of Science and Technology, June-August 2016



Higher Education (Abroad)

Due to the innovative research and publication in high impact journals, the students of the Centre are offered admissions in top-notch institutions in the US, Europe, and other developed countries.

1. Jasman Malik – University of Michigan, USA
2. Ankit Kukreja – University of Houston, USA
3. Ankit Dhingra – University of Michigan, USA
4. Ashish Mendiratta – University of Michigan, USA
5. Vibhor Jain – Cass Business School, London
6. Vismit Bansal – University of California, Berkley, USA
7. Varun Vohra – University of California, Berkley, USA
8. Abhinav Jain – University of Michigan, USA
9. V.Manish – University of Michigan , USA
10. Dhruv Gupta – RWTH Aachen University, Germany
11. Samarth Jain – Purdue University, USA
12. Souma Roy – Purdue University, USA
13. Abhishek Goyal – National Tsing Hua University, Taiwan
14. Shaswat Anand – Massachusetts Institute of Technology, USA
15. Shivani Pande - Universiteit Gent, Belgium
16. Yash Chandra – National University of Singapore, Singapore
17. Bhupender Suhag – Polytechnic University of Milan, Italy
18. Saurabh Dey – Georgia Institute of Technology, USA
19. Jatin Dewanwala – Columbia University, USA
20. Sumit Duggal – European Institute of Design, Italy
21. Ajay Jeph – University of Southern California, USA
22. Harsh Arora – Wright State University, USA
23. Shivank Garg - University of Texas, USA

Higher Education (India)

The students get to work in teams and develop entrepreneurship skills while working at the Centre which helps them secure admissions in the best business schools in India.

1. Shashank Jaiswal, IIM Kozikhode
2. Arjun Khurana, IIM Kolkata
3. Abhishek Agarwal, IIM Ahmedabad
4. Kanchan Chanana, SP Jain, Mumbai
5. Mayank Gupta, IISc Bangalore
6. Vaibhav Ahlawat, ISB Hyderabad
7. Bikram Jeet Singh, XLRI Jamshedpur
8. Aditya Malik, IIM Ahmedabad
9. Chinmaya Mishra, IIT Delhi
10. Vipul Vibhanshu, IIT Delhi
11. Sanjay Singh, SP Jain, Mumbai
12. Gaurav Gupta, IIM Kozikhode
13. Arjun Srivastava, IIT Delhi



Overseas Students at Centre

The Centre also attracts students from other developing countries considering the facilities, innovative projects, and research competence. The following students from Africa have worked in the Centre.

1. Dr. Yahaya Alhassan, Nigeria
2. Dr. Ftwi Yohanees Hagos, Ethiopia

The overseas students/researchers/working professionals are welcome to the Centre for collaborative research, higher studies and exchange of knowledge.



For suggestions and queries and also for collaborative research projects, consultancy & internships opportunities at the Centre; **please contact:**



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