



AVIT
AARUPADAI VEEDU INSTITUTE OF TECHNOLOGY



**VINAYAKA MISSION'S
RESEARCH FOUNDATION**
(Deemed to be University under section 3 of the UGC Act 1956)

RESEARCH CENTRE FOR ALTERNATE FUELS TESTING

Department of Mechanical Engineering
Aarupadai Veedu Institute of Technology

VISION

Research Centre for Alternate Fuels testing is dedicated to develop advanced concepts and methods for performance analysis of bio fueled IC engines, and pursuing solutions through wide-ranging industrial collaborations, discussions and seminars. The center is committed to achieving its mission using innovative science, technology, education and Management, strategies having high impact for all stakeholders.

MISION

Research Centre for Alternate Fuels testing is an important research community that expands the visibility of research understanding and findings. It aims to create the awareness to the research fraternity about the alternative fuels derived from organic matters (vegetable substance). Since, biofuels derived from organic matters has played a vital role in the environmental issues to reduce the harmful automobile emissions.

RESEARCH CENTRE FOR

ALTERNATE FUELS TESTING

MILESTONE & ACHIEVEMENTS

Research Centre for Alternate Fuels testing Center was established in the Department of Mechanical Engineering of Aarupadai Veedu Institute of Technology on June 30, 2014. Research Centre for Alternate Fuels testing is dedicated to the research activities in alternative fuels testing and to Determine the impact of biofuels properties on engines efficiency, performance, and emissions. Activities include examining ways to increase alternative fuel vehicles' fuel economy, investigating the potential effects of upcoming blends, and improving the quality of current and future biofuel blends.

S.NO	YEAR	DESCRIPTION
1	2014-2015	<ul style="list-style-type: none">▶ Installation of Research engine setup which includes VCR Engine, AVL five Gas Analyzer, BOSCH smoke meter, worth an amount of 15 Lakhs rupees.▶ Consultancy work has been done for an amount of Rs.34000/-▶ 15 UG projects were done by our students.▶ As an outcome of 12 research articles published by using this research lab
2	2015-2016	<ul style="list-style-type: none">▶ Consultancy work has been done for an amount of Rs.55300/-▶ 18 UG projects were done by our students.▶ As an outcome of 19 research articles published by using this research lab
3	2016-2017	<ul style="list-style-type: none">▶ Additional testing setup up gradation done by providing variable nozzle hole like single, two- and five-hole nozzles purchased.▶ Consultancy work has been done for an amount of Rs.49000/-▶ 20 UG projects were done by our students.▶ As an outcome of 10 research articles published by using this research lab.▶ 8 Faculty members registered for their PhD under this alternate fuel thrust research area
4	2017-2018	<ul style="list-style-type: none">▶ Additional testing setup up gradation done by implementing EGR and turbo charger setup with a cost worth Rs.40000/-▶ Consultancy work has been done for an amount of Rs.35200/-▶ 18 UG projects were done by our students.▶ As an outcome of 11 research articles published by using this research lab▶ 3 Faculty members registered for their PhD under this alternate fuel thrust research area
5	2018-2019	<ul style="list-style-type: none">▶ Additional research setup of bio diesel processor installed with costs around Rs.1,25,000/-, through that we can convert vegetable oils into biodiesel.▶ 18 UG projects were done by our students.▶ As an outcome of 22 research articles published by using this research lab
6	2019-2020	<ul style="list-style-type: none">▶ Installation GDI Engine Modification and Eddy current dynamometer worth an amount of Rs 1,65,200/-▶ 24 UG projects were done by our students▶ As an outcome of 32 research articles published by using this research lab▶ One faculty member completed his PhD under this alternate fuel thrust research area by using this research lab for his experimental works
7	2020-2021	<ul style="list-style-type: none">▶ Additional testing setup up gradation done by implementing HCCI engine test set up under seed money project support scheme of VMRF with an amount of Rs 2,58,420/-▶ 13 UG projects were done by our students▶ As an outcome of 37 research articles published by using this research lab▶ Two faculty members completed their PhD under this alternate fuel thrust research area by using this research lab for their experimental works

MAJOR RESEARCH AREAS



- Engine Combustion
- Alternative fuels
- Exhaust gas after-treatment
- Biodiesel and other biofuels
- Primary alcohols and bio-butanol
- HCCI of gasoline and diesel like fuels
- Regulated and unregulated emissions
- Split Ignition Strategy
- GDI Engine

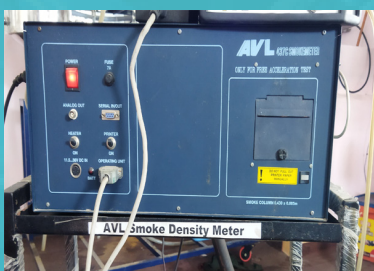


VCR ENGINE WITH EDDY CURRENT DYNAMOMETER

MAJOR FACILITIES

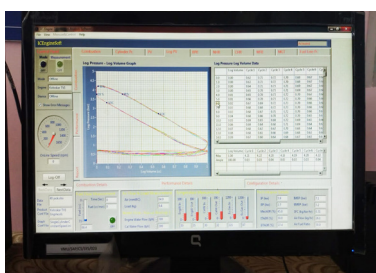
SINGLE CYLINDER, FOUR STROKE, CRDI VCR (VARIABLE COMPRESSION RATIO) ENGINE

The setup consists of single cylinder, four stroke, CRDI VCR (Variable Compression Ratio) engine connected to eddy current dynamometer. It is provided with necessary instruments for combustion pressure, crank-angle, airflow, fuel flow, temperatures and load measurements. The setup enables study of CRDI VCR engine performance with programmable ECU at different compression ratios and with different EGR. Engine performance study includes brake power, indicated power, frictional power, BMEP, IMEP, brake thermal efficiency, indicated thermal efficiency, Mechanical efficiency, volumetric efficiency, specific fuel consumption, Air fuel ratio, heat balance and combustion analysis.



ENGINE PERFORMANCE AND EMISSION ANALYSIS TEST SETUP

DATA ACQUISITION SYSTEM



SOFTWARE : LAB VIEW BASED
ENGINE SOFT

High Speed Combustion Data Acquisition (DAQ) systems are very important for engine combustion and performance investigations. It is provided with necessary instruments for combustion pressure, crank-angle, airflow, fuel flow, temperatures and load measurements. These signals are interfaced to computer through high speed data acquisition device.

EMISSION MEASUREMENT EQUIPMENT



AVL SMOKE DENSITY METER

This Research Centre has world class emission characterization systems for regulated and unregulated gaseous emission species. This equipment is capable of measuring regulated pollutant species like NO_x, CO, CO₂, HC and smoke opacity.

BIODIESEL PILOT PLANT

In this setup, a new method has been employed to produce Bio-Diesel. The production of the Bio-Diesel is done by using Bio-Diesel processor. It requires the used vegetable oil, methanol and the lye with the accurate proportionate. It consists of the mono alkyl esters formed by a catalyzed reaction of the triglycerides in the oil or fat with a simple monohydric alcohol. The reaction conditions generally involve a trade-off between reaction time and temperature as reaction completeness is the most critical fuel quality parameter. This process has been developed to produce biodiesel from high free fatty acid feed stocks, such as recycled restaurant grease, animal fats, and soap stock. The objective of this bio-diesel plant is to produce the bio-diesel by using the bio-diesel processor



SAMPLE BIODIESEL



BIODIESEL PROCESSOR

CURRENT RESEARCH

- Experimental investigations of HCCI/ PCCI combustion in a single cylinder research engine using conventional fuels and biofuels.
- Experimental investigations of combustion characteristics and emissions of a biodiesel fueled engine.
- Experimental investigations of fuel sprays of biodiesel, straight vegetable oils and their blends with mineral diesel.
- Engine Performance, Combustion and Emission Characteristics of GDI engine with gasoline / blended fuels - in Stratified and Homogeneous mode
- Engine Performance, Combustion and Emission Characteristics of liquid fuels in RCCI mode

LIST OF EQUIPMENTS

- APEX MAKE PSP 240PE Research Engine setup with programmable open ECU
- AVL Make Exhaust gas analyser- O₂,CO,CO₂,HC,NOX
- Bosch Smoke meter
- EGR Set Up –Manual Controlling VCR Engine
- Turbo charge set up to VCR ENGINE
- Open ECU to control Fuel Injection Timing, Fuel Injection Pressure, Ignition Timing, etc
- Engine Modification - Piston, Cylinder Head, Fuel Supply System and any other modifications.
- EGR with intercooler
- 3 - way catalytic converter PM Filter
- Selective Catalytic Converter
- Fuel Injection Driver for 4 injectors and 2 High Pressure Pumps control
- Bio fuel production set up 10 liter capacity

FACILITIES

- Computerized Research engine set up,
- Diesel and Petrol mode VCR Engine Soft for Engine performance and combustion analysis
- Performance and combustion analysis Using EGR Concept
- Performance and combustion analysis Using Turbo Charger Set up
- Programmable open ECU for engine tuning in Petrol mode
- Programmable open ECU for engine tuning in Diesel mode Split Injection Strategies
- HCCI, PCCI and
- RCCI Engine
- Port fuel injection
- Exhaust gas analyzer (5 Gas)
- Bosch Smoke meter,
- Production of biodiesel using Advanced Bio Fuel Plant

SERVICES AVAILABLE

Research and consultation work in the field of alternative fuels have been carried out with the following details

Test with Blends

- Testing with all Liquid Fuels (Diesel, Petrol, Alcohols, blends etc.)
 - Single Compression ratio Variable Load
 - Variable Compression ratio Variable Load
 - Single Compression ratio Variable Load Variable Nozzle Hole
 - Single Compression ratio Variable Load with EGR
 - Variable Compression ratio Variable Load with EGR
 - Single Compression ratio Variable Load with Turbocharger
 - Variable Compression ratio Variable Load with Turbocharger
 - Single Compression ratio Variable Load with EGR & Turbocharger
- HCCI & RCCI Mode Engine performance and Emission Analysis
- Additional manifold gas injection
- Selective Catalytic Converter
- Dual fuel gas, Liquid at CI, SI Mode Operation
- Production of biodiesel using Advanced biodiesel Processor



FACULTY MEMBERS ASSOCIATED



Dr.M.Prabhakar



Mr. K. Surendra babu



Dr.S.Sangeetha



Mr. N. Lakshmi narayanan



Mr. J. Senthil



Mr.C.Thiagarajan



Dr.M.Saravana Kumar



Dr.S.Prakash



Mr.N.Siva Kumar



Mr.B.Samuel Michael

CONTACT ADDRESS

Dr.M.PRABHAKAR,
RESEARCH CENTRE FOR ALTERNATE FUELS TESTING
DEPARTMENT OF MECHANICAL ENGINEERING,
AARUPADAI VEEDU INSTITUTE OF TECHNOLOGY,
VINAKAYA MISSION'S RESEARCH FOUNDATION, PAIYANOOR - 603 104
MOBILE NO : 9444310236. MAIL ID : mprabhakar@gmail.com