



## RESEARCH CENTRE FOR ALTERNATE FUEL TESTING



**AARUPADAI VEEDU  
INSTITUTE OF TECHNOLOGY**  
(An Constituent College of Vinayaka Mission's Research Foundation)



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



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# **Research Centre For Alternate Fuel Testing**

**DEPARTMENT OF MECHANICAL ENGINEERING**

**AARUPADAI VEEDU INSTITUTE OF TECHNOLOGY  
VINAKAYA MISSION'S RESEARCH FOUNDATION  
PAIYANOOR – 603 104**



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## **Research Centre For Alternate Fuel Testing**

### **Mission**

Centre of Excellence for Alternate Fuels 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.

### **Vision**

Centre of Research for Alternate Fuels is dedicated to develop advanced concepts and methods for performance analysis of bio fuelled 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.

### **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
- Port fuel injection
- Exhaust gas analyzer (5 Gas)
- Bosch Smoke meter
- Production of biodiesel using Advanced Bio Fuel Plant

### **Research Lab facilities for UG/PG and Research scholars**

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. These signals are interfaced to computer through high speed data acquisition device. The setup has stand-alone panel box consisting of air box, twin fuel tank, manometer, fuel measuring unit, transmitters for air and fuel flow measurements, process indicator and piezo powering unit. Rotameters are provided for engine cooling water and calorimeter water flow measurement. CRDI VCR engine works with programmable Open ECU for Diesel injection, fuel injector, and common rail with rail pressure sensor and pressure regulating valve, crankposition sensor, fuel pump and wiring harness. 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, brakethermal efficiency, indicated thermal efficiency, Mechanical efficiency, volumetric efficiency, specific fuel consumption, Air fuel ratio, heat balance and combustion analysis.

### Components Specification:



Make	Kirloskar –TV1
Power and Speed	3.5 kW and 1500 rpm
Type of engine	Single cylinder, DI and 4 Stroke
Compression ratio	17.5:1 to 12:1
Bore and Stroke	80 mm and 110 mm
Method of loading	Eddy current dynamometer
Method of starting	Manual cranking or Self Starter
Method of cooling	Water
Type of ignition	Compression ignition
Inlet valve opening	4.5° before TDC
Inlet valve closing	35.5° after BDC
Exhaust valve opening	35.5°before BDC
Exhaust valve closing	4.5° after TDC
Fuel injection timing	23° before TDC
Nozzle opening pressure	210 bar
Lube oil	SAE40

## BIO FUEL PLANT

### Components Specification:

#### Transesterification Unit.



Size : 450mm height \* 300mm dia  
Capacity : 10 liter

#### Stirrer motor:

Voltage controlled stirrer, three Speed (50 rpm to 1500rpm), Spindle length (60cm). Spindle material (ss), two or three set of blades.

#### Heater:

Temperature (50° to 100°c)  
Capacity 30 liters  
Voltage controlled  
(automatic cut off if reacted specified temperature).

2.0 KW Heater Coil: Tubular (sheathed) elements normally comprise a fine coil of nichrome (NiCr) resistance heating alloy wire, that is located in a metallic tube of stainless steel and insulated by magnesium oxide powder

**Pressure gauge:**

0 to 20 psi

**Pressure release valve**

The pressure is relieved by allowing the pressurized fluid to flow from an auxiliary passage out of the system. The relief valve is designed or set to open at a predetermined set pressure to protect pressure vessels and other equipment from being subjected to pressures that exceed their design limits

**Temperature Sensor:**

RTD 0-120°C temperature sensors

Resistance thermometers, also called resistance temperature detectors (RTDs), are sensors used to measure temperature. Many RTD elements consist of a length of fine wire wrapped around a ceramic or glass core but other constructions are also used. The RTD wire is a pure material, typically platinum, nickel, or copper.



## Meth-oxide unit.



Size : 250mm height \*300mm dia

Capacity : 10 liter

### **Stirrer motor:**

Voltage controlled stirrer, three Speed (50 rpm to 1500rpm), Spindle length (20cm).

Spindle material (ss), two or three set of blades

## **Methanol recovery Tank**

### **Washing / Drying Unit**



Size : 450mm height \* 300mm dia

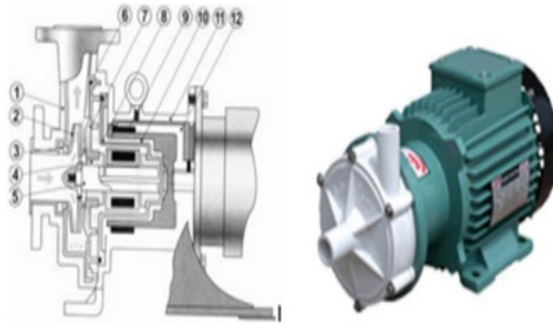
Capacity : 10 liter

### **Temperature sensor:**

RTD 0-120°C temperature sensors

Resistance thermometers, also called resistance temperature detectors (RTDs), are sensors used to measure temperature. Many RTD elements consist of a length of fine wire wrapped around a ceramic or glass core but other constructions are also used. The RTD wire is a pure material, typically platinum, nickel, or copper.

## Mixing pump



These pumps are 100% Leak Proof Magnetic Drive pumps. There is no shaft seal used and the impeller provides the rotation with the help of Magnetic drive. High Power permanent rare earth Magnets are used in magnetic drive arrangement which gives high mechanical efficiency with zero slippage.

These pumps are 100% Leak Proof and ideally suitable for handling corrosive chemicals, toxic and fuming liquids, acids, electroplating chemicals, dyes, solvents, petrol, kerosene, pharmaceutical and food syrups etc.

All PMD Magnetic Drive Pumps are available in Monoblock type only with Std TEFC motor and Flame Proof motors

Material of Construction (fluoride): GFRPP  
(Reinforced Poly Propylene), PVDF (polyvinylidene)

Operating Temp: PP upto 70°C. PVDF upto 100°C

## Features & Application

- 100% Leak Proof Pumps
- No Shaft Seal to maintain, replace
- High Efficiency due to permanent magnet power coupling
- Simple design, easy to operate & maintain
- Very useful for handling highly corrosive chemicals, plating chemicals, toxic & fuming liquids

## Range

- Capacity from 10 LPM upto 570 LPM
- Head upto 32 mtrs.

## Heat Exchanger



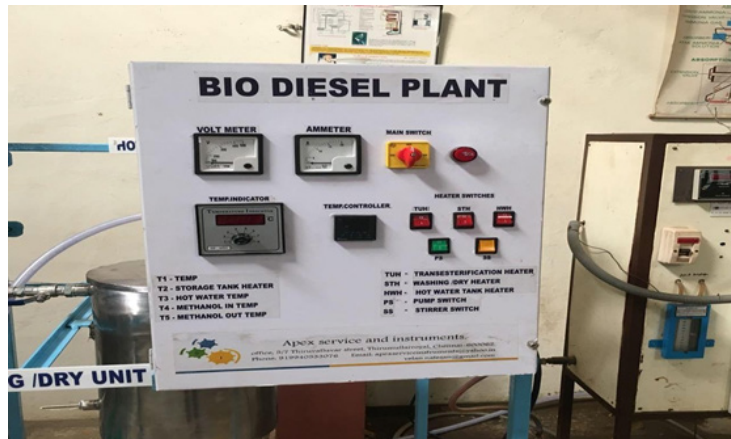
Sheet and tube (copper tube). Shell side (Water Flow) Tube Side (Methanol flows Copper tube inner dia: 12mm Copper tube dia: 14mm Total copper tube: 6 no's Over all diamantine: 300mm height \*120mm dia

### Temperature sensors:

RTD: 0-120°C: 2 NOS

Cooling water inlet /outlet tube connection tube dia: 6mm  
Hot water TANK 25 Liters with 2.kw Heater coil

### Main electrical panel board



All temperature sensors, 3 Heater coil, pump switch, two stirrer motors, switches, along with voltmeter, and analog meter, Main tank temperature controlling unit are provided in the electrical panel bord

## **Consultancy Work Details:**

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

### **Test with Blends**

- 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
- Variable Compression ratio Variable Load with EGR & Turbocharger
- Production of biodiesel using biodiesel Processor



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