



**AARUPADAI VEEDU  
INSTITUTE OF TECHNOLOGY**  
OMR, PAIYANOUR, CHENNAI - 603104



**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**

## **RESEARCH BOOKLET**



## **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 Excellence 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, crank position 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, brake thermal efficiency, indicated thermal efficiency, Mechanical efficiency, volumetric efficiency, specific fuel consumption, Air fuel ratio, heat balance and combustion analysis.

### **Components Specification:**





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



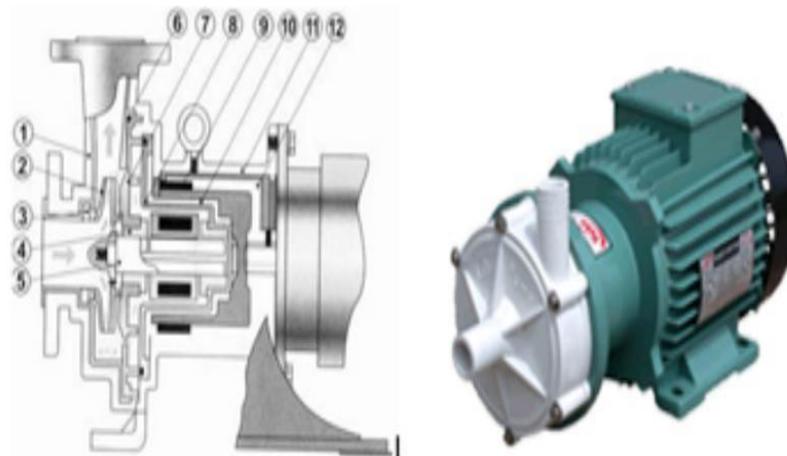
**Size:** 450mm height \* 300mm dia

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 is provided 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 (Reim Forced 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

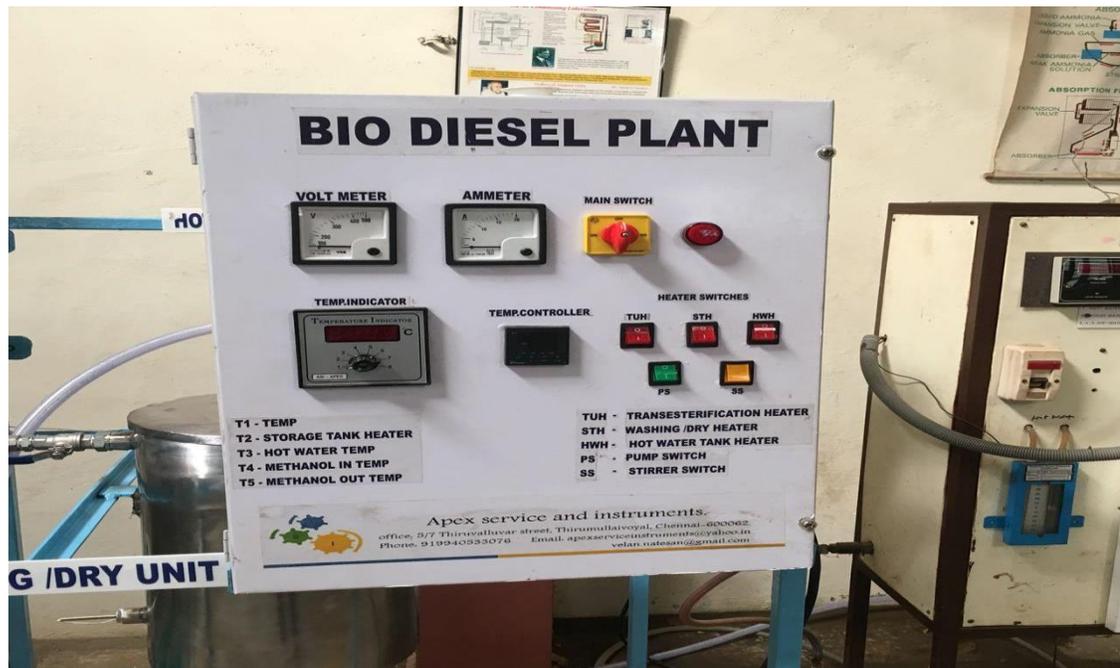
Temperature sensors:

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 board



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### **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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