Yangon Technological University

Department of Mechanical Engineering

Research on Renewable Energy

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Research Area

- Solar Energy
- Energy Storage
- Hydro Power
- Wind Energy
- Bio-fuel

Solar Energy

Solar Photovoltaic Thermal Collector

water outlet temperature increase 5 °C at flow rate of 0.5 l/min

Energy Storage

Latent Heat Storage Unit

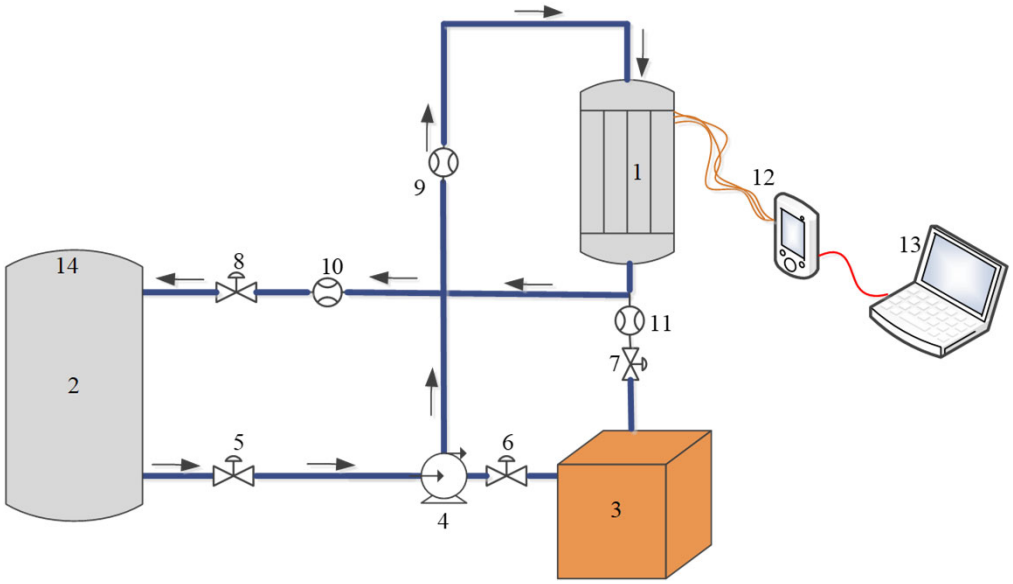


Figure. Schematic Sketch of the Experimental Setup

(1) energy storage tank (main storage tank)

(2) constant temperature tank (heat source)

(3) cold water storage tank

(4) centrifugal pump

(5), (6), (7) and (8) flow control valves

(9), (10), (11) flow meters

(12) thermocouples and data logger

(13) personal computer

Latent Heat Storage Unit

- Stearic Acid (Commercial Grade)

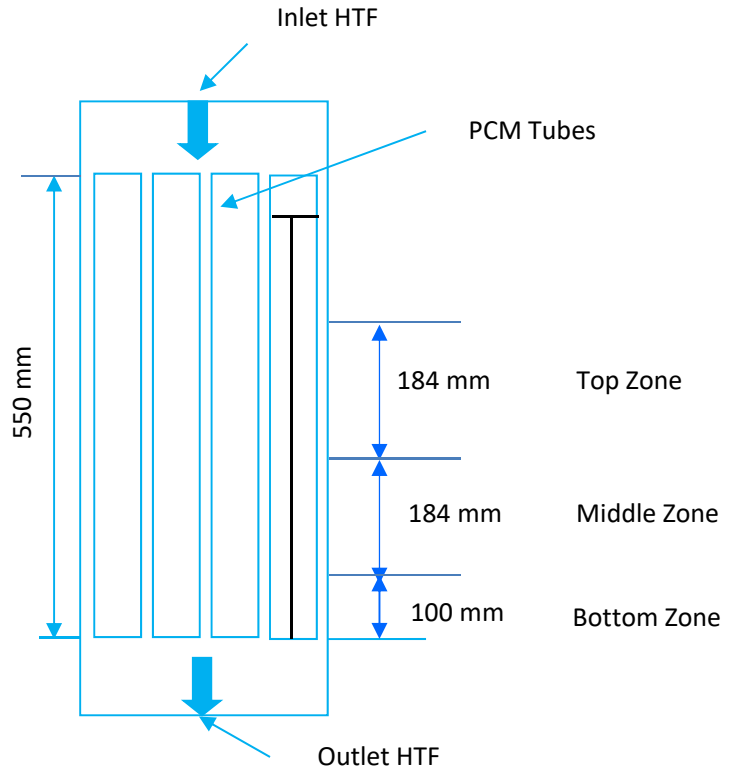
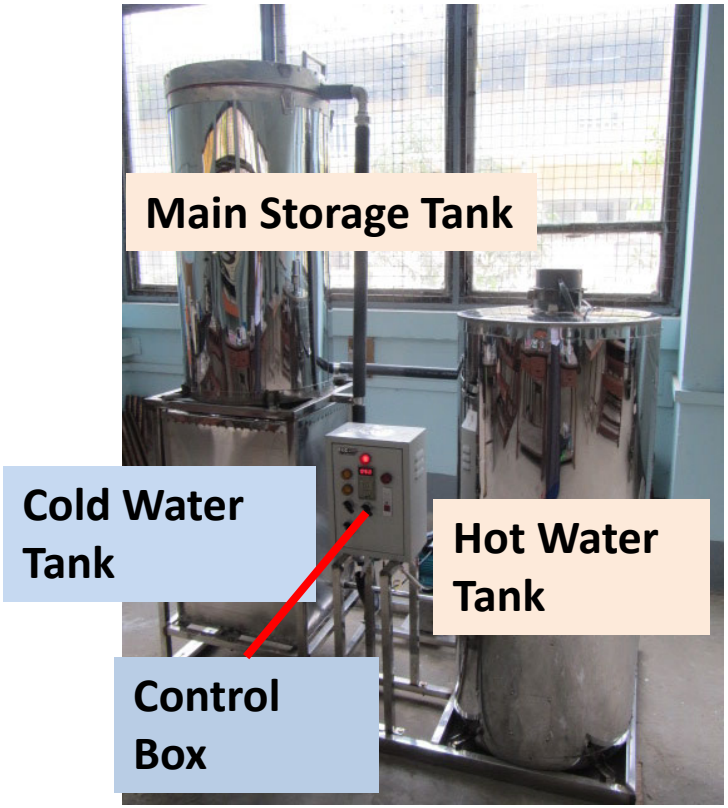
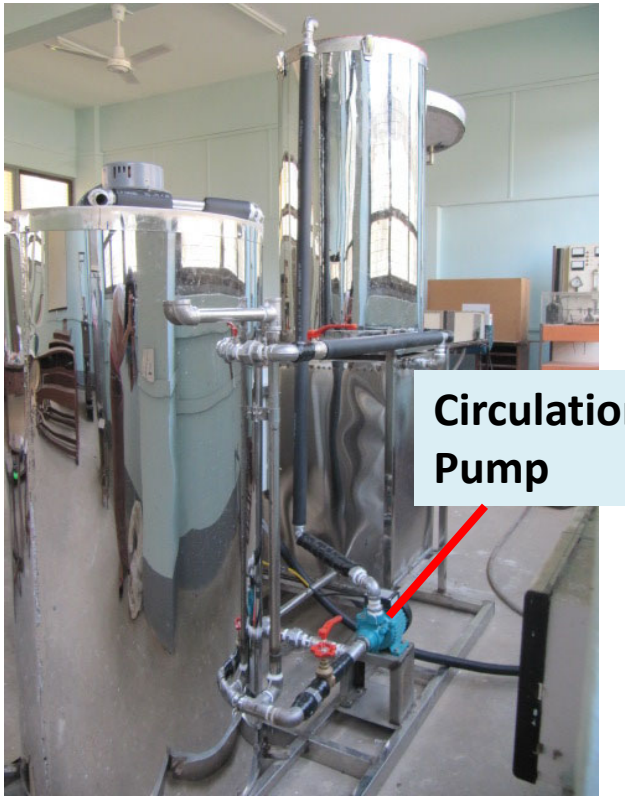


Figure. Schematic Diagram of the Main Storage Tank

Actual Test Rig





Experimental Result

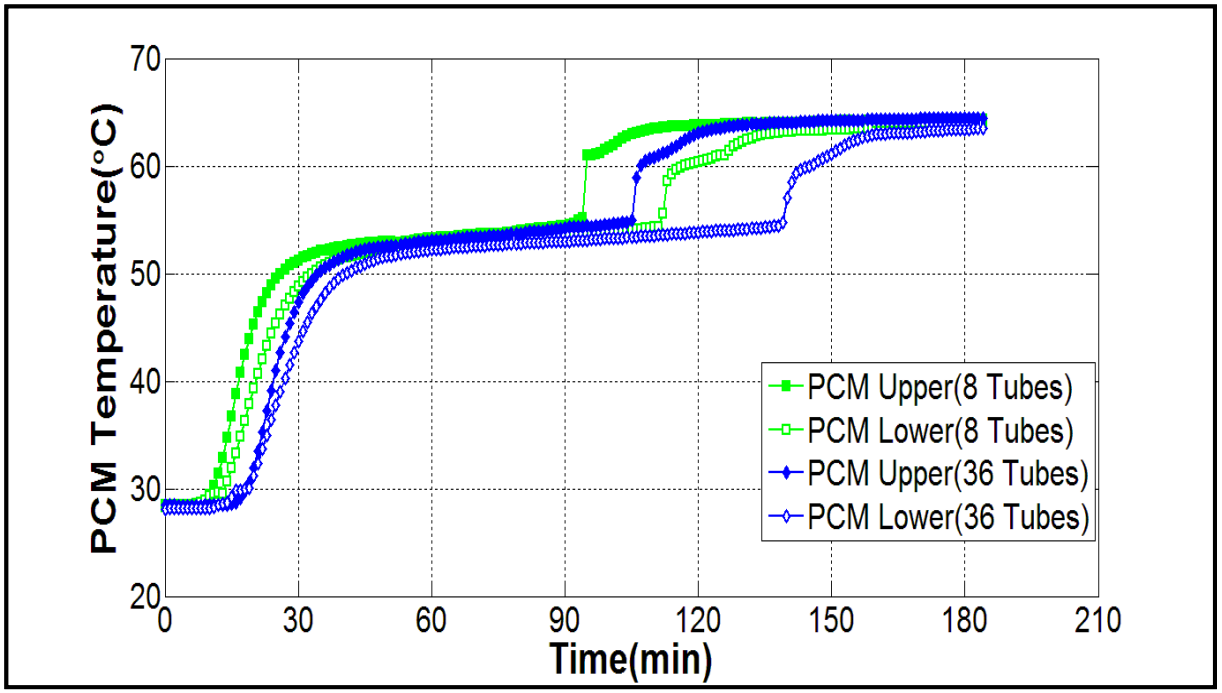


Figure. Temperature Profiles of PCM for Different Number of Tubes (Volume Flow Rate 2 l/min, 80 % PCM Tube Volume)

Experimental Result

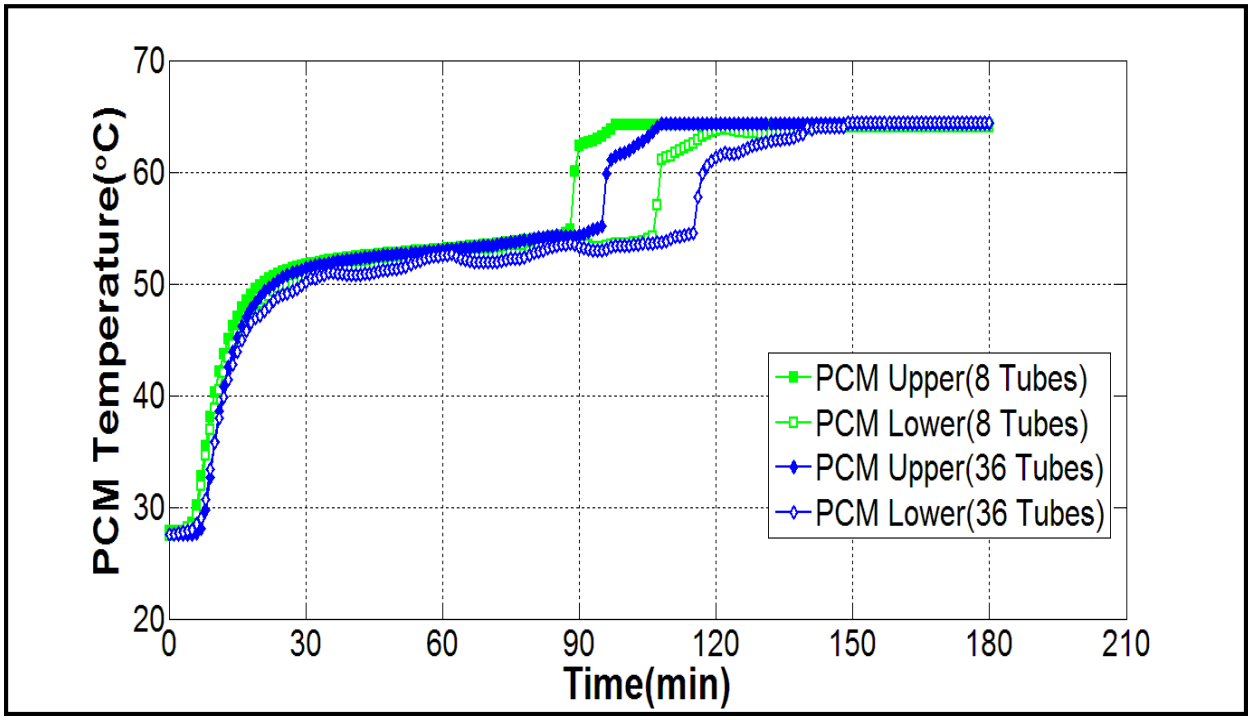
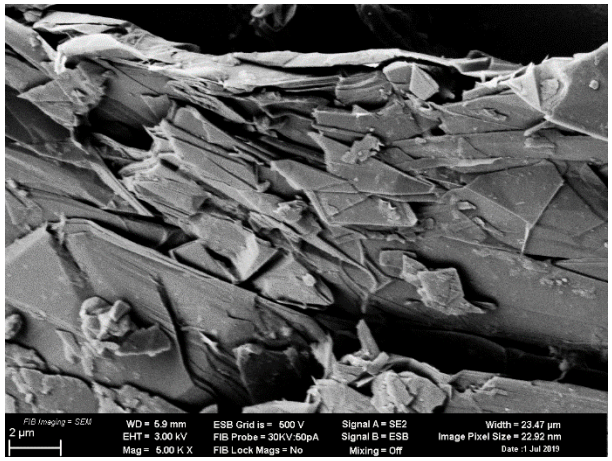
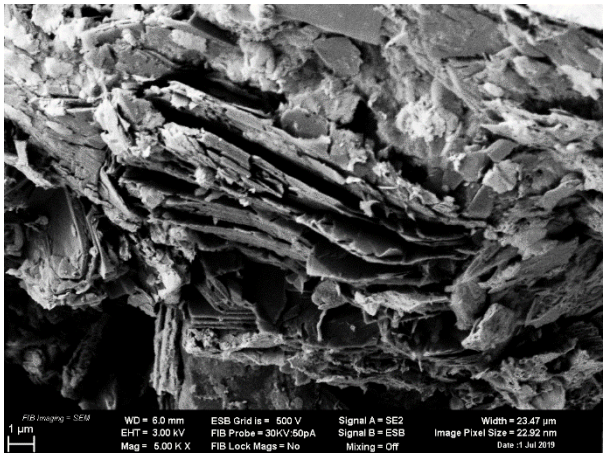


Figure. Temperature Profiles of PCM for Different Number of Tubes (Volume Flow Rate 6 l/min, 80 % PCM Tube Volume)

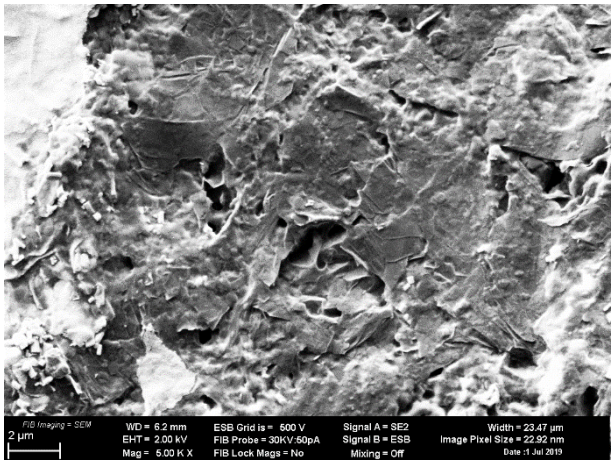
Experimental Result



Natural Graphite



Expanded Graphite



SA/10% EG composite PCM

Experimental Result

Pure SA: k = 0.28 W/m.K

SA/10% EG composite: k = 0.653 W/m.K

Hydro Power

Sketch of the Cross Flow Turbine (500 Watts) Experimental Facility

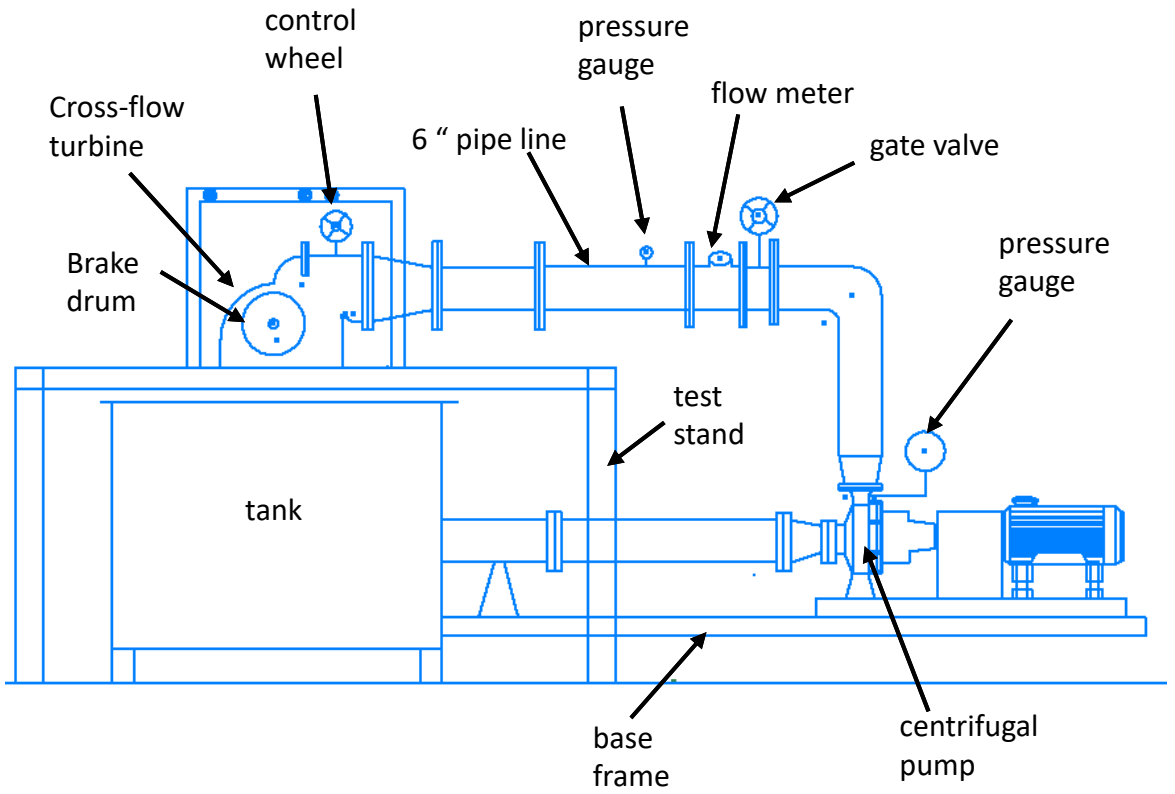


Figure. Schematic layout of Cross Flow Turbine Test Rig

Experimental Apparatus of 500 Watts Cross-Flow Turbine

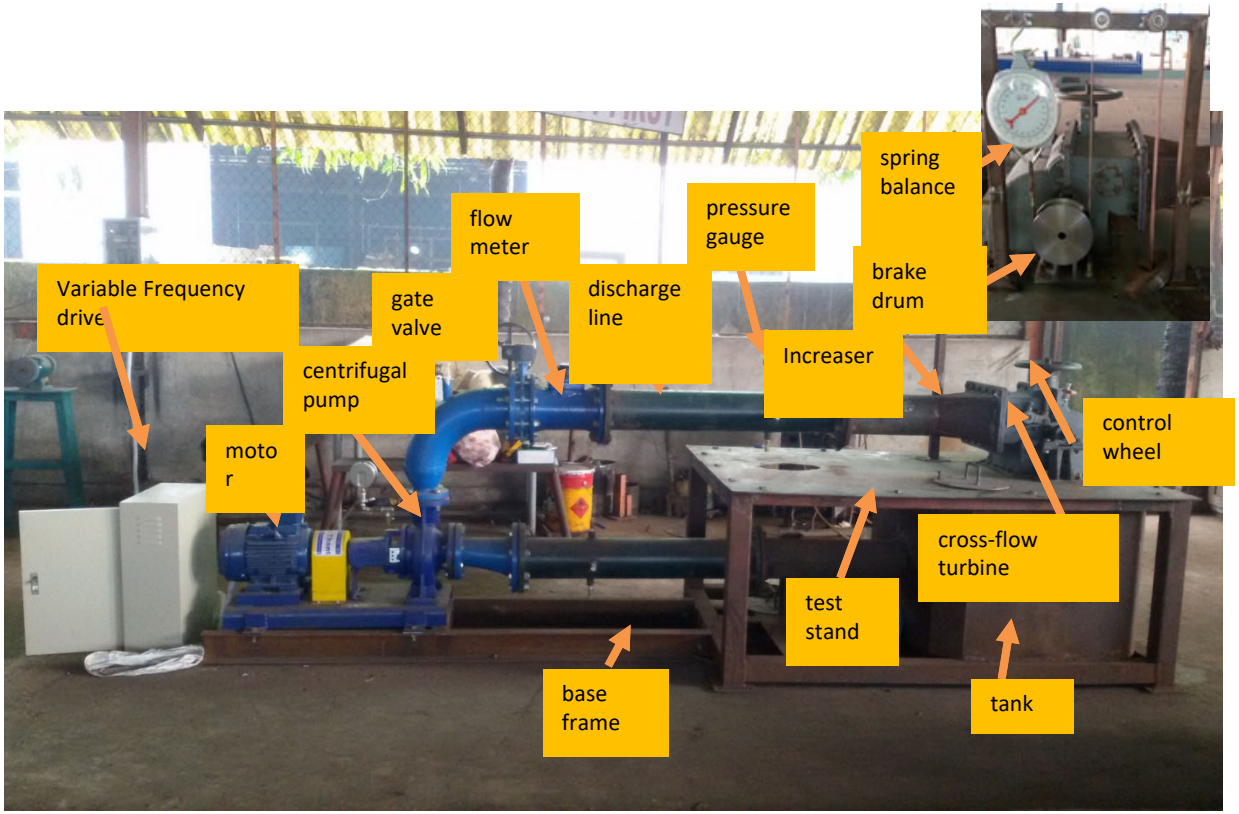
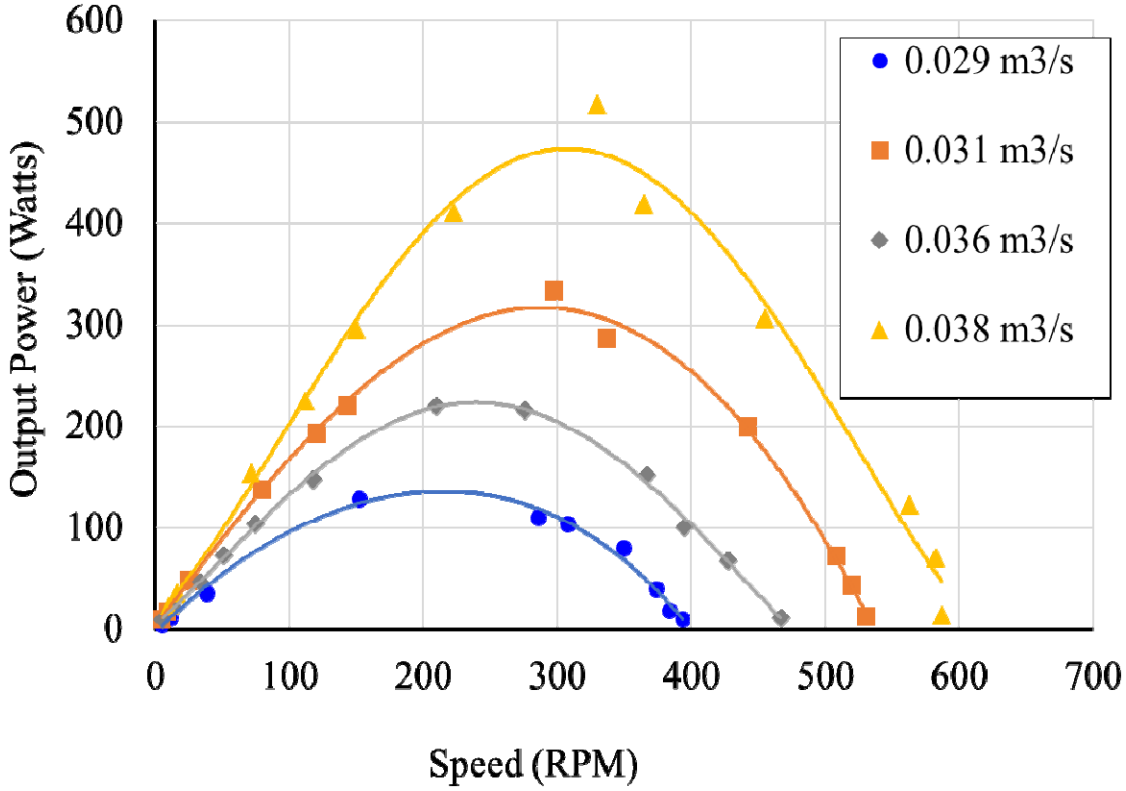
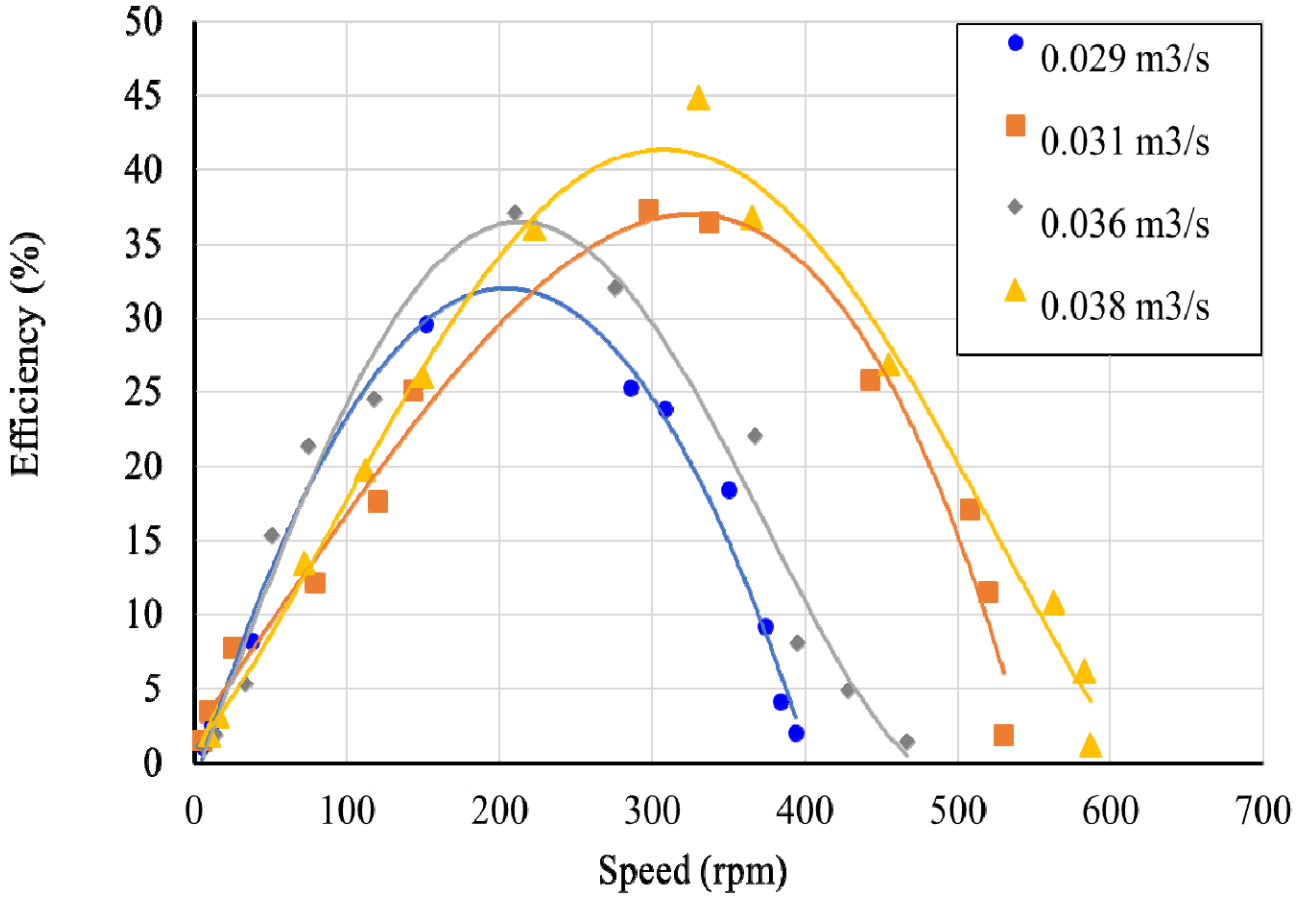


Figure. Experimental set-up of 500 Watts Cross-Flow Turbine

Characteristic of Output Power (Head and Flow rate = constant)



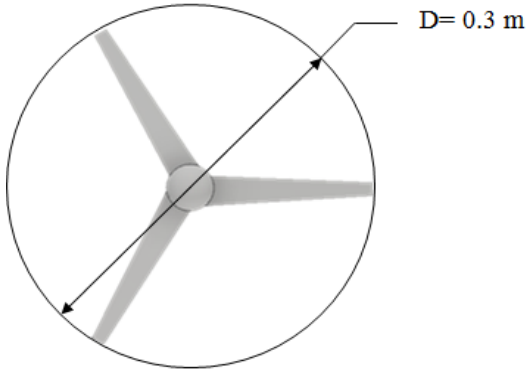
Characteristic of Efficiency (Head and Flow rate = constant)



Wind Energy

Parameters of the HAWT Rotor

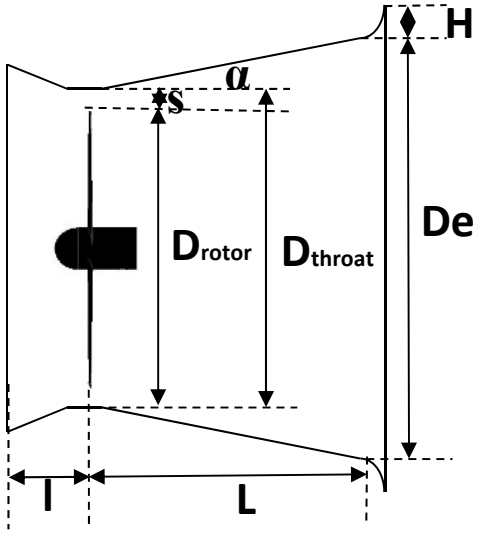
Parameter	Value
Chord length, c (mm)	22.69
Tip speed ratio, λ	5
Rotor diameter, d (mm)	300
Cut-in Velocity (m/s)	7
Rated velocity (m/s)	9
Cut-out velocity (m/s)	13.5
Number of revolution (rpm)	2800
Airfoil Type	NACA 4412



Front view of the rotor

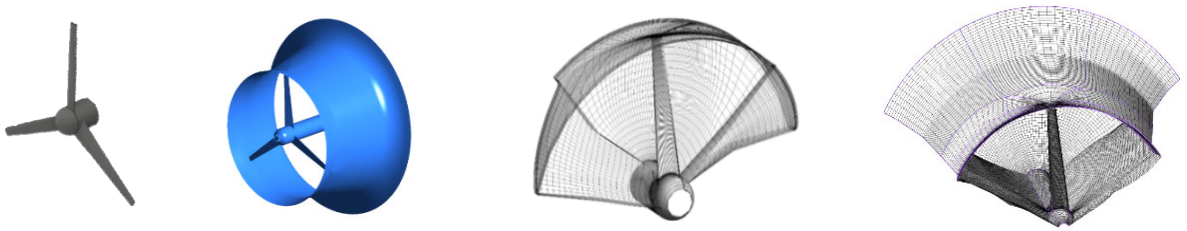
Design Parameters of the DAWT

No.	Parameter	Dimensions
1.	Rotor diameter (D)	300 mm
2.	Throat diameter (D_{throat})	310 mm
3.	Exit diameter (D_e)	370 mm
4.	Length of the diffuser (L)	170 mm
5.	Diffuser angle (α)	11̊
6.	Length (l)	45 mm
7.	Height of the diffuser (H)	57 mm
8.	Inlet diameter	330 mm

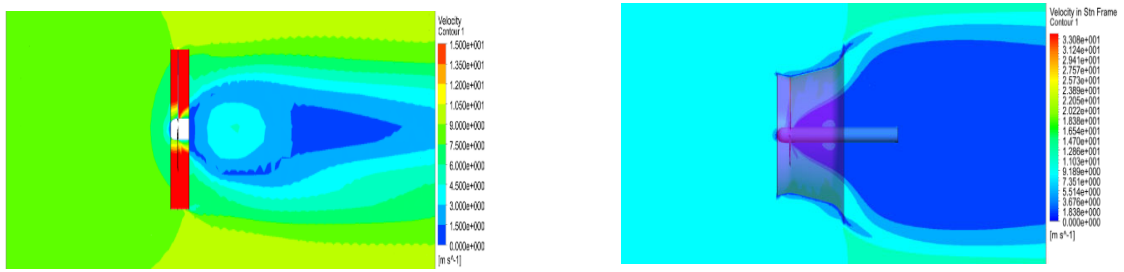


Sketch of the diffuser

Numerical Simulation



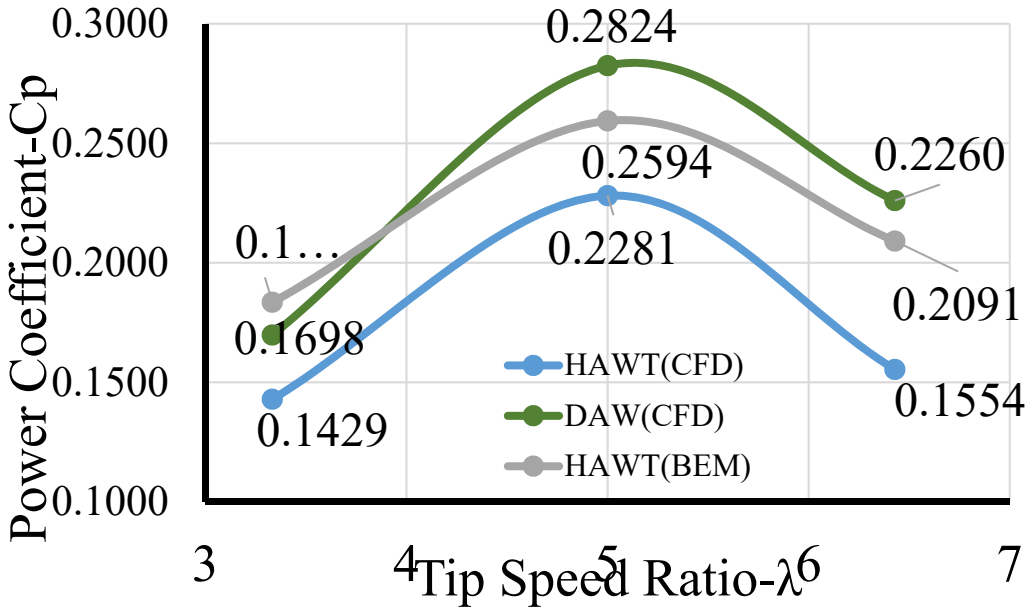
Geometry and mesh generation of the HAWT and DAWT



Velocity contours of HAWT and DAWT

Performance Comparison between HAWT and DAWT

Velocity	Torque	
	HAWT	DAWT
7	0.0112	0.0077
9	0.0297	0.0240
13.5	0.0603	0.0507



Cp of DAWT is about 25% higher than that of HAWT.

RPM = 2800

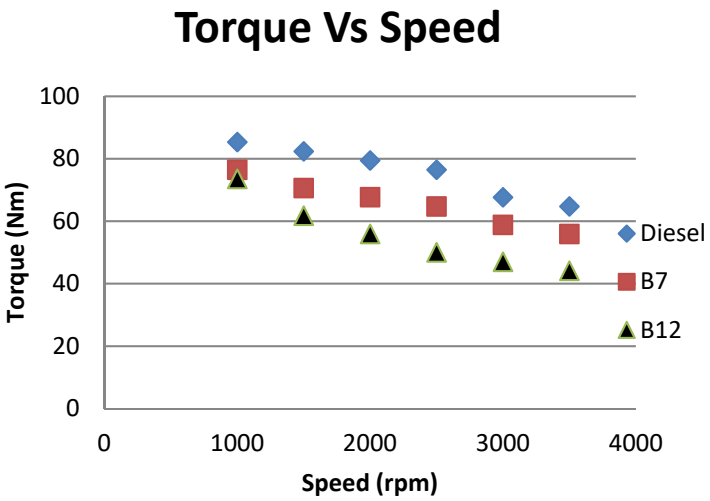
Research Area

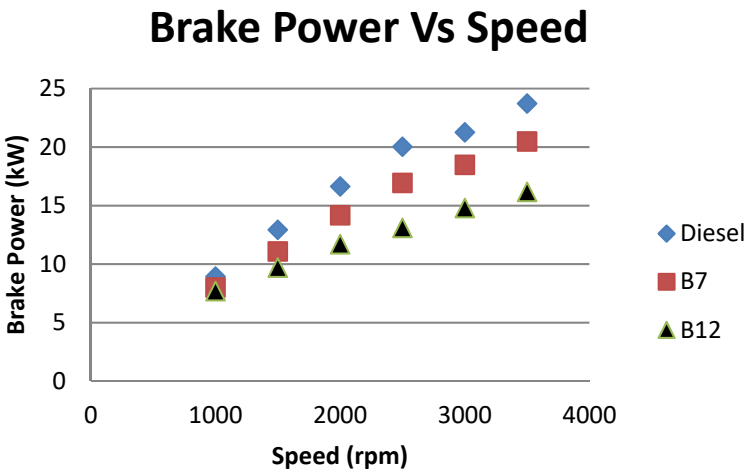
Bio-fuel

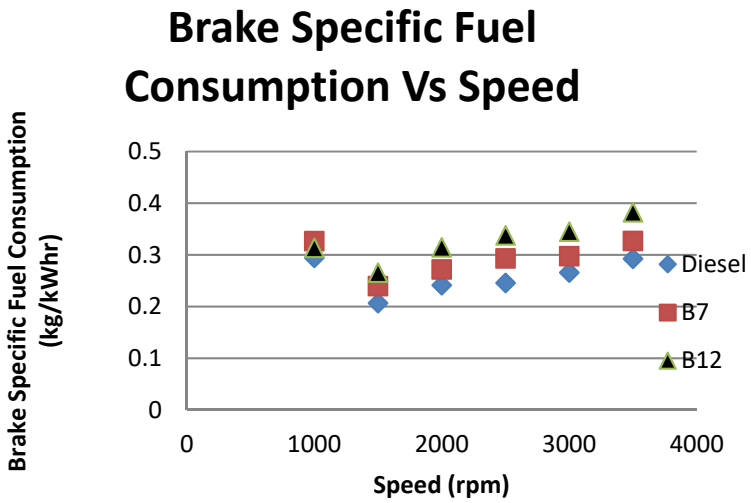
Engine Performance Testing of Biodiesel and Diesel

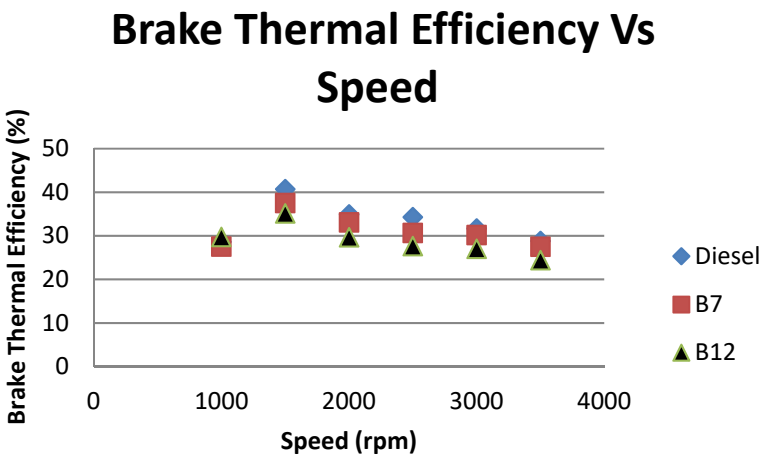
Model	Ford XLD 418 T
Type	Turbocharged Automotive Build, Water-cooled Indirect Injection, CI Engine
Working Cycle	Four Stroke
Number of Cylinders	4 (In-Line)
Firing Order	1-3-4-2
Bore	82.5 mm
Stroke	82.0 mm
Displacement	1753 cc
Compression Ratio	21.5 : 1
Maximum Power	55 kW at 4500 rpm
Maximum Torque	152 Nm at 2200 rpm

Engine Performance Testing of Biodiesel and Diesel

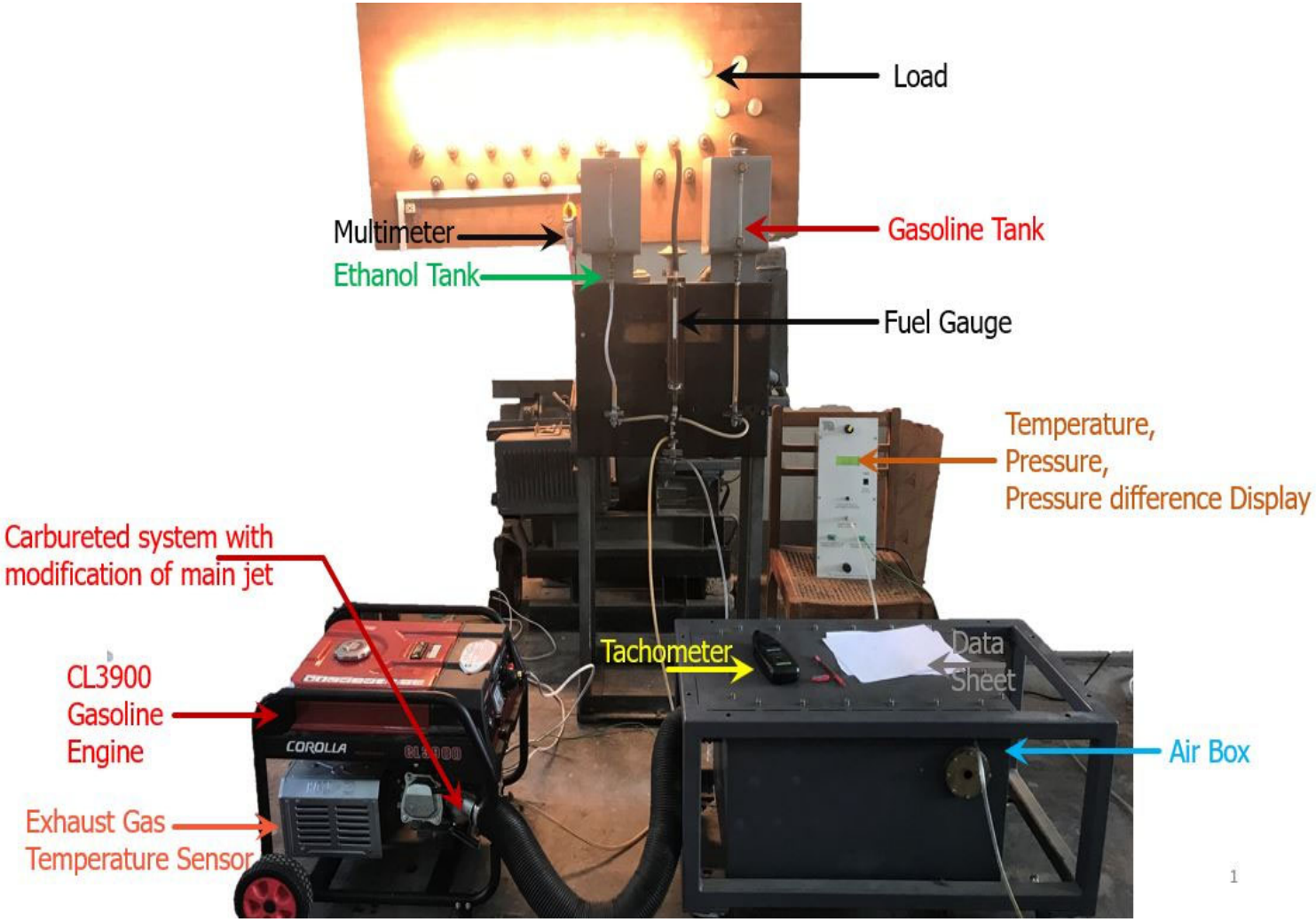




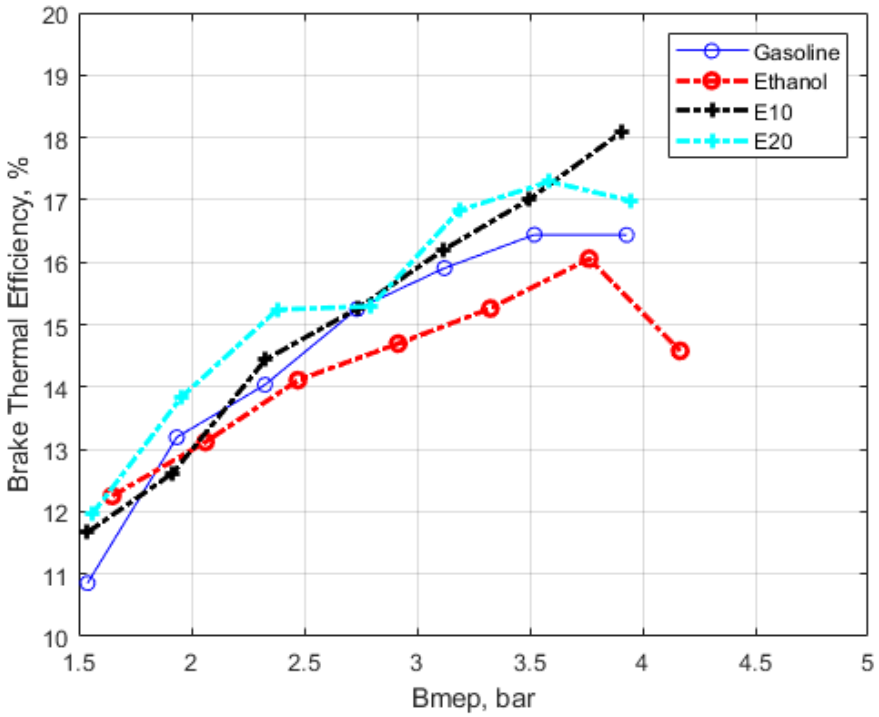




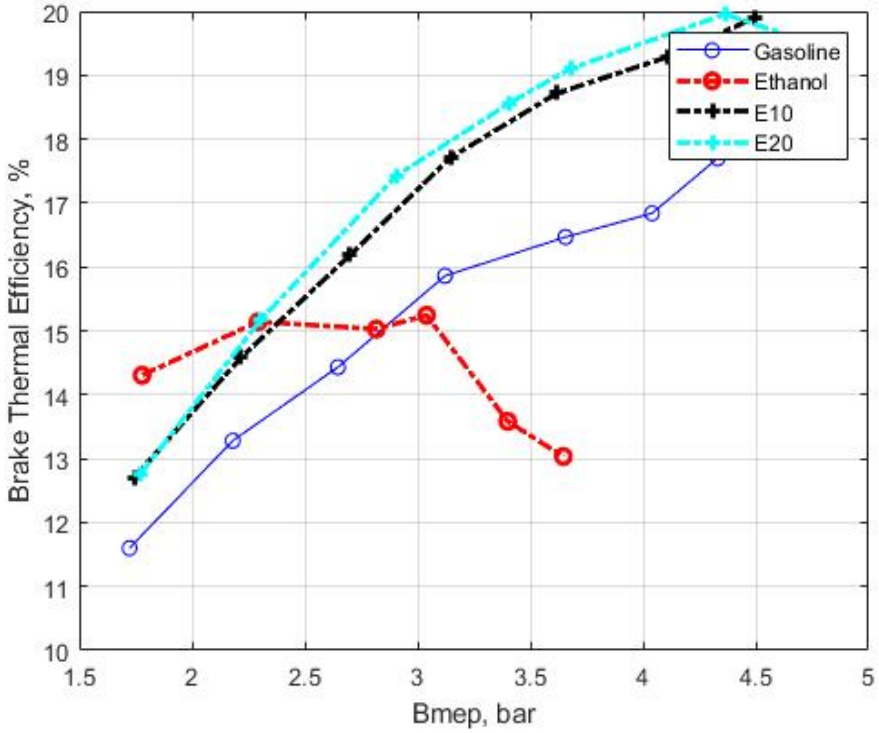
Engine Performance Testing of Ethanol



Engine Performance Testing of Ethanol



compression ratio 8



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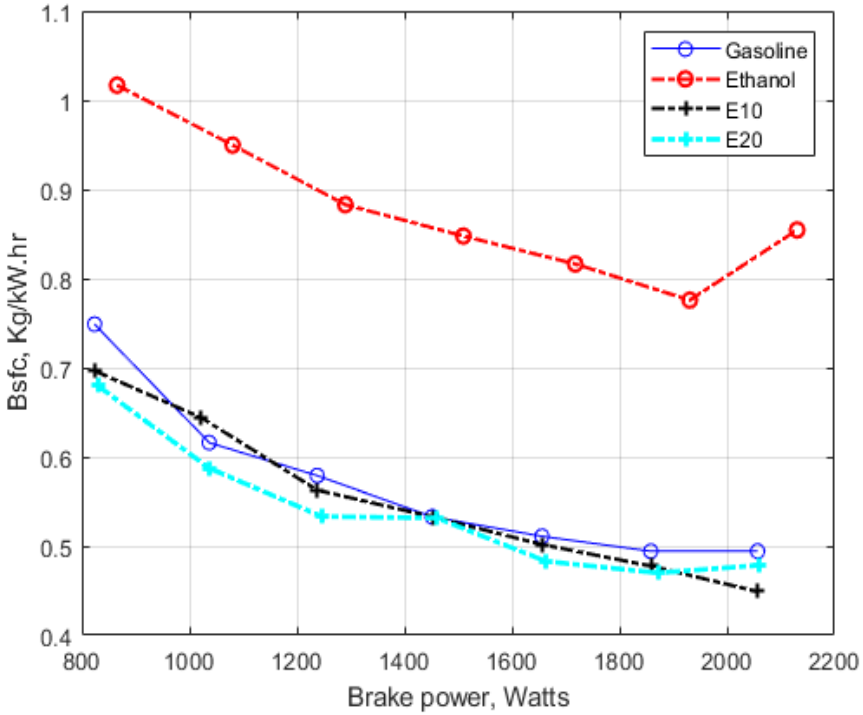
Engine Performance Testing of Ethanol



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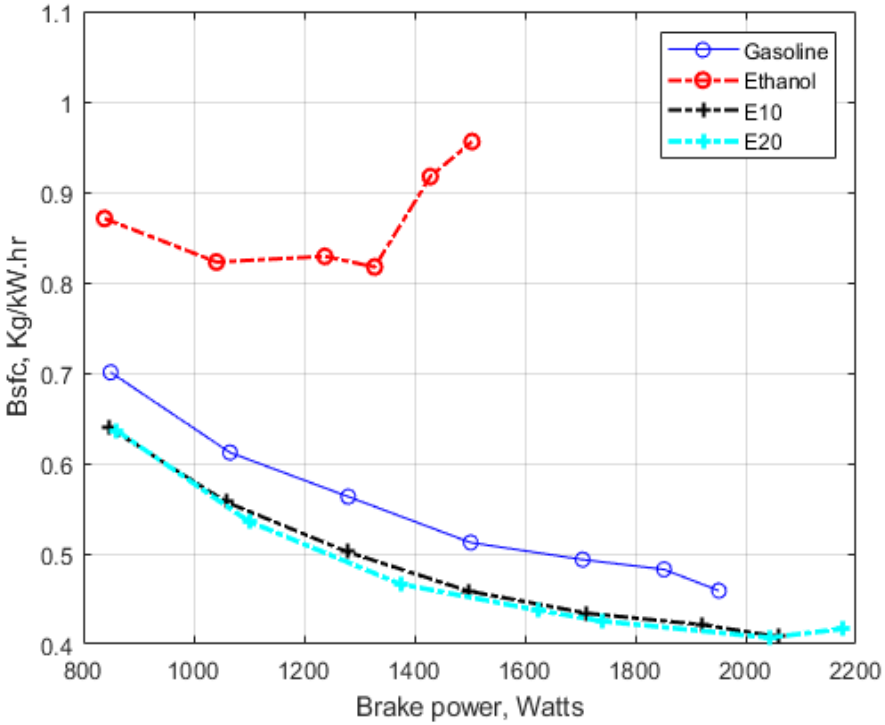

compression ratio 9

THANK YOU

FOR YOUR KIND

ATTENTION