Kirloskar Engine TV 1 Specifications

Type: Four Stroke, Single Cylinder Vertical Water Cooled Diesel Engine

Rated power	-	**5.2 kW**
Rated Speed	-	**1500rpm**
Bore Dia (D)	-	**87.5 mm**
Stroke (L)	-	**110 mm**
Compression ratio	-	**17.5:1**
C.V. of Fuel for diesel		**42,000kJ/kg**
Density of Diesel	-	**830 kg/m^3**

EDDY CURRENT DYNAMOMETER

Make: Techno Mech

Model: TMEC-10

$$kW = \frac{Nm \times RPM}{9549305}$$

Max: kW= 7.5

RPM: 1500-6000

Dynamometer arm length --- (Rm) 185 mm

Combustion graphs	**Select columns**
pressure bar vs crank angle deg F	A,B insert scatter
Rate of pressure rise bar/deg F	A,C insert scatter
Net heat release J/deg -50-+50	A,J insert scatter
cumulative heat release KJ -50-+50	A,K insert scatter
mass fraction burned % S --- E	A,O insert scatter
mean gas temp deg C -50-+50	A,P insert scatter
pressure bar- volume cc F	D,B insert scatter
Log pressure bar-log volume cc F	F,E insert scatter
sheet 1 0% load - Sheet 5 100% load	

AVL DI GAS 444 N (Five gas analyzer)

Measurement data	Resolution
Co – 0-15% Vol	0.0001% Vol
HC- 0-20000 ppm Vol	1ppm/10ppm
CO_2 – 0-20% Vol	0.1% Vol
O_2 – 0-25% Vol	0.01%Vol
NOx 0-6000 ppm Vol	1 ppm Vol

AVL 437C SMOKE METER

Measurement data	Resolution
Opacity – 0-100%	0.1%
Absorbtion(K Value)	0-99-99m^{-1} 0.01m^{-1}

Model calculations

Maximum Load calculation

Maximum load (W) = $\frac{BP \times 60 \times 1000}{2 \pi N R_m}$ **= _____ N = _____ kgf**

BP = Rated power in kW

N = Rated speed = 1500 rpm

R = Radius of the Dynamometer arm length in m

1. Brake power (BP) = $\frac{2 \pi N (W \times 9.81) Rm}{60 \times 1000}$ **= _____ kW**

N = Speed of the engine in 'rpm'

(W) = Applied load in 'N'

R m = Radius of the dynamometer arm length M'

2 Indicated Powers (IP) **IMEP value is on performance report page no 3, 10.**

$$\frac{(IMEP)\ 10^5 LAN/2}{60000} = KW$$

IMEP = indicated mean effective pressure in bar

L= Stroke length in m

D= Cylinder diameter in m

A= Cylinder area in m^2

$$A = \frac{\pi D^2}{\text{-------}} = m2$$

3. Total fuel consumption (TFC) = q x Density of diesel = ----------kg = kg

------

t

q = Volume of fuel consumed = 10 x 10^{-6} m^3

t = Time taken for 10 g of fuel consumption in's'

4. Specific Fuel consumption (SFC) = $\frac{TFC}{BP}$ **= kg/kWh**

TFC = Total fuel consumption in kg/h

BP = Brake Power in kW

5. Mechanical Efficiency (η_M) = $\frac{BP}{IP} x\ 100$ = _____ %

6. Brake Thermal efficiency (η_{BT}) = $\frac{BP}{TFC\ x\ CV} x\ 100$ = _____ %

TFC = Total fuel consumption in kg/s

CV = Calorific value of fuel = 42,500 kJ/kg

BP = Brake power in kW

7. **Indicated Thermal efficiency** (η_{IT}) = $\frac{IP}{TFC\ x\ CV} x\ 100$ = _____ %

TFC = Total fuel consumption in kg/s CV = Calorific value of fuel = 42,500 kJ/kg

IP = Brake power in kW

Temperature	Water Flow Liter per hour
Engine cooling water Inlet T1	Fuel line F1
Engine cooling water Outlet T2	Air inlet F2
Calorimeter water Inlet T3	Engine cooling water 200 lph F3
Calorimeter water Outlet T4	Calorimeter water 100 lph F4
Calorimeter Exhaust gas In T5	Pressure transmitter PT
Calorimeter Exhaust gas Out T6	Crank angle Encoder N
HBP heat brake power, HJW heat water jacket, HGas heat exhaust gas, HRad heat radiation.	

Tabulation of Results

Load	Applied load	Total fuel consumption	Specific fuel consumption	Brake power	Indicated power	Mechanical Efficiency	Brake thermal efficiency	Indicated thermal efficiency
	Kg	TFC	SFC	BP	IP	η_M	η_{BT}	η_{IT}
%	kgf	kg/s	kg/kWh	kW	kW	%	%	%

Result

The performance test on the given four stroke engine has been conducted and the following graphs were drawn. BP vs SFC, BP vs η_M, BP vs η_{BT}, BP vs η_{IT}