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- 1) Processes in Diesel Cycle
 - a) Process 1-2: Isentropic compression
 - b) Process 2-3: Constant pressure heat addition
 - c) Process 3-4: Isentropic expansion
 - d) Process 4-1: Constant volume heat rejection

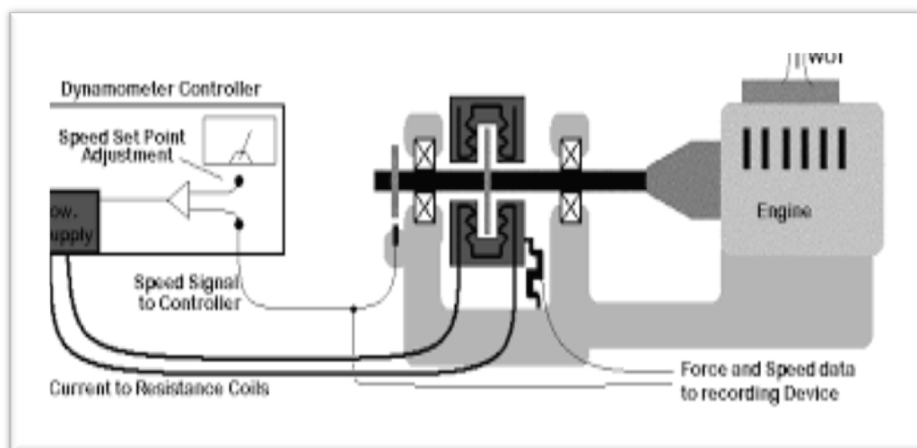
B. Working Principle Of Diesel Engine

A four-stroke diesel engine is internal combustion engine in which the piston complete four separate stroke while turning the two revolution of crankshaft to obtain one power stroke. A stroke refers to the full travel of the piston from top dead center to the bottom dead center cylinder, in either direction. It works on compressing the air at high temperature inside the cylinder which the piston completes four separate strokes while turning and inject diesel in combustion chamber at that point ignition take place and desired work obtained at crankshaft. The four separate strokes are as follows:

- 1) Suction Stroke
- 2) Compression Stroke
- 3) Power Stroke
- 4) Exhaust Stroke

II. METHODOLOGY

A. Experimental Setup



B. Specification of Testing Engine

| Specification | Engine Details |
|-------------------|---|
| Engine | Double cylinder, high speed diesel engine |
| Cooling | Water cooled |
| Compression ratio | 16: 1 |
| Bore | 79.5 mm |
| Stroke | 76 mm |
| Capacity | 735.65 CC |
| Bhp | 10 |
| Rated Speed (RPM) | 1500 |
| Manufacturer | Comet Engineering |

C. Experimental Procedure

Test Rig Consist Following Elements

- 1) Temperature measuring unit.
- 2) Load and Speed measurement unit.
- 3) Water measurement arrangement.
- 4) Fuel consumption unit.
- 5) Exhaust gas calorimeter.
- a) Checking all switches and starting the diesel engine setup.
- b) Exserting the load on engine using dynamometer arrangement with the help of dimmer and load cell.
- c) Note down all parameters listed below
 - Time for 10ml fuel consumption in sec.
 - Exhaust Gas Temperature.
 - Load on Dynamometer
 - Temperature of inlet and outlet cooling water.
 - Temperature of exhaust gas outlet from calorimeter.
- d) Repeat same procedure for various load and note down various readings.
- e) Experiments performed at starting from no load observations to be having for at different loads. Observations are listed down as per parameters.
- f) Various performance parameters to be measured at each load. Using measured data, so we can able to find out brake power, brake thermal efficiency, brake specific energy consumption to following parameters

D. Calculation Related Formulae

Formulas to calculate brake power, brake thermal efficiency and brake specific energy consumption are described below:

1) Brake Power

$$B.P. = 2\pi NT / 60000 \text{ KW}$$

$$T = F \times g \times \text{Arm Length}$$

T= Torque, Nm.

N = RPM of engine crankshaft

2) Brake Thermal Efficiency

$$BTE = B.P / mf \times C.V$$

$$mf = \text{vol} \times \rho / t$$

mf = mass of fuel supplied, kg/sec

ρ = Density of Diesel, Kg/m³

t = Fuel flow time, sec.

C.V = Calorific value of fuel, j/kg

B.P. = Brake power, kw

3) Brake Specific Fuel Consumption

$$BSFC = mf \times 3600 / B.P \text{ kg/kWh}$$

mf = Mass of fuel supplied, kg/h

B.P = Brake Power, kw

4) Sample Calculations of Parameters

Standard data:

Specific density of diesel = 830 Kg/m³

Calorific Value of diesel = 42000 KJ/Kg

Arm length = 0.185 m

a) *Brake Power*

$$\begin{aligned} T &= F \times g \times \text{Arm Length} \\ &= 12 \times 9.81 \times 0.185 \\ &= 21.78 \text{ Nm.} \end{aligned}$$

$$\begin{aligned} \text{B.P.} &= 2\pi NT/60000 \text{ KW} \\ &= 2\pi \times 1500 \times 21.78/60000 \\ &= 3.42 \text{ KW} \end{aligned}$$

b) *Brake Thermal Efficiency*

$$\begin{aligned} \text{BTE} &= \text{B.P}/\text{mf} \times \text{C.V} \\ \text{mf} &= \text{vol} \times \rho / t \\ &= 10 \times 10^{-6} \times 830/24.3 \\ &= 0.000341 \text{ Kg/sec} \end{aligned}$$

$$\begin{aligned} \text{BTE} &= 3.42/0.000341 \times 42000 \\ &= 0.2356 \times 100 \\ &= 23.56 \% \end{aligned}$$

c) *Brake Specific Fuel Consumption*

$$\begin{aligned} \text{BSFC} &= \text{mf} \times 3600/\text{B. P kg/kWh} \\ &= 0.0003412 \times 3600/3.42 \\ &= 0.356 \text{ KJ/Kg.h} \end{aligned}$$

III. CONCLUSION

With the help of above experimental procedure and formula, we can find Brake Power, Brake specific fuel consumption and Brake Thermal Efficiency. Since, from the above data we can predict the performance of the specific diesel engine.

REFERENCES

- [1] Zehra Sachin, Mustafa Tuti and Orhan Durgun, 2014, Experimental investigation of the effects of water adding to the intake air on the engine performance and exhaust emissions in a DI automotive diesel engine, Fuel, 115, 884–895
- [2] V. Ganesan, test book of IC Engine.
- [3] R. K. Rajput, test book of IC Engine.
- [4] https://en.wikipedia.org/wiki/Diesel_engine/
- [5] Tesfa B, Mishra R, Gu F, and Ball AD, 2012, Water injection effects on the performance and emission characteristics of a CI engine operating with biodiesel, Renew Energy, 37.



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