Published on *Mechanical Engg Simple Notes ,Solved problems and Videos* (https://mechdiploma.com)

Name four sensors used in I.C. engine and explain working of any one.

Sensor used in IC engines (Explanation of any one)

A sensor is an input device that provides variable information on an engine function. Examples of sensors include the airflow sensor (AFS), crank angle sensor (CAS), throttle potentiometer sensor (TPS) etc, and these provide data on load, rpm, temperature, throttle opening etc. This data is signaled to the ECM, which then analyses the results and computes an output signal. The output signal is used to actuate an n output device.

Define i) Humidity ratio, ii) Specific humidity

Specific humidity : It is defined as the ratio of mass of vapor to the mass of dry air in a given sample of moist air . It is denoted by ω

$$\text{Specific humidity} = \frac{\text{Mass of water vapour in mixture}}{\text{Mass of dry air in mixture}}$$

Compare closed cycle and open cycle gas turbine.

Open cycle and closed cycle gas turbines Any four differences

Sr.no	Factors	Open cycle gas turbine	Closed cycle gas turbine
1.	**Pressure**	Lesser pressure	Higher pressure
2.	**Size of the plant for given output**	Larger size	Reduced size
3.	**Output**	Lesser output	Greater output
4.	**Corrosion of turbine blades**	Corrosion takes place due to contaminated gases	No corrosion since there is indirect heating.
5.	**Working medium**	Loss of working medium	No loss of working medium.
6.	**Filtration of incoming air**	It may cause severe problem.	No filtration of air is required.
7.	**Part load efficiency**	Less part load efficiency	More part load efficiency
8.	**Thermal efficiency**	Less thermal efficiency	More thermal efficiency
9.	**Requirement of cooling water**	No Requirement of cooling water	Larger amount of cooling water required
10.	**Weight of system for given power**	Less	More
11.	**Response to the changing load**	Good response	Poor response
12.	**Fluid friction**	More Fluid friction	Less Fluid friction

---

List any four pollutants in exhaust gases of I.C. engine with their effects.

The major air pollutants emitted by petrol & diesel engines are CO2, CO, HC, NOx, SO2, smoke & lead vapour. Effect of CO: Carbon

monoxide combines with hemoglobin forming carboy hemoglobin ,which reduces oxygen carrying capacity of blood. This leads to laziness, exhaustion of body & headache. Prolong exposure can even leads to death. It also affects cardiovascular system, thereby causing heart problem Effect of CO2: Causes respiratory disorder & suffocation.

A four stroke gas engine has a cylinder diameter of 25 cm and stroke 45 cm…

Gas pressure

$= 750 + \frac{136}{13.6} = 760$ mm of Hg

$= \frac{760}{750} = 1.0133$ bar

Let subscript 1 refer to gas condition

& 2 to NTP (1.013 bar, 0°C)

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

$$\frac{1.013 \times 7.5}{290} = \frac{1.013 \times V_2}{273}$$

$V_2 = 7.06 m^3$ in 40 min

Gas supplied/min $= \frac{7.06}{40} = 0.1765 m^3/min$

Heat supplied $= m_f \times C.V.$

$= 0.1765 \times 19 \times 10^3$

$= 3353.5$ KJ/min (100%)

B.P. $= 2\pi NT$

$= 2\pi \left(\frac{8080}{40}\right) \times 90 \times 9.81 \times \frac{1.6}{2}$

$= 896.82$ KJ/min (26.7%)

Heat lost to cooling water $= m C_p (T_2 - T_1)$

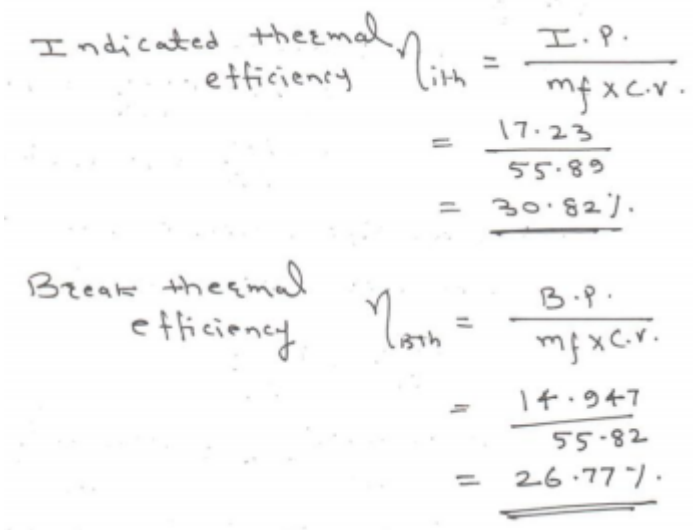
$= \frac{180}{40} \times 4.1868 \times 45$

$= 847.82$ KJ/min (25.28%)

Heat unaccounted

$= 3353.5 - (896.8 + 847.82)$

$= 1608.88$ KJ/min (48%)



A single stage reciprocating air compressor has a swept volume of 2000 cm3 and runs at 800 rpm.

Q2 b) Let V_s = swept volume

$V_c = V_3$ = clearance volume

We have

$V_s = V_1 - V_3$

$V_s = V_1 - 0.05 V_s$

$V_1 = 1.05 V_s$

Indicated Power

$$= \frac{n}{n-1} P_1 V_1 \left(\left(\frac{P_2}{P_1} \right)^{\frac{n-1}{n}} - 1 \right) \times \frac{N}{60}$$

$$= \frac{1.25}{1.25-1} \times 0.013 \times 10^5 \times 0.05 \times 2000 \times \left[\left(\frac{8}{1} \right)^{\frac{0.25}{1.25}} - 1 \right] \times \frac{800}{60}$$

$$= 7.313 \text{ KW}$$

Isothermal Power $= P_1 V_1 \log \left(\frac{P_2}{P_1} \right) \times \frac{N}{60}$

$$= \left(1.013 \times 10^5 \times 1.05 \times \frac{2000}{10^6} \times \log \frac{8}{1} \right) \times \frac{800}{60}$$

$$= 5.8978 \text{ KW}$$

Isothermal efficiency

$$= \frac{\text{Isothermal Power}}{\text{Indicated Power}}$$

$$= \frac{5.8978}{7.313} = 80.6\%$$

Differentiate vapour compression and vapour absorption refrigeration system.....

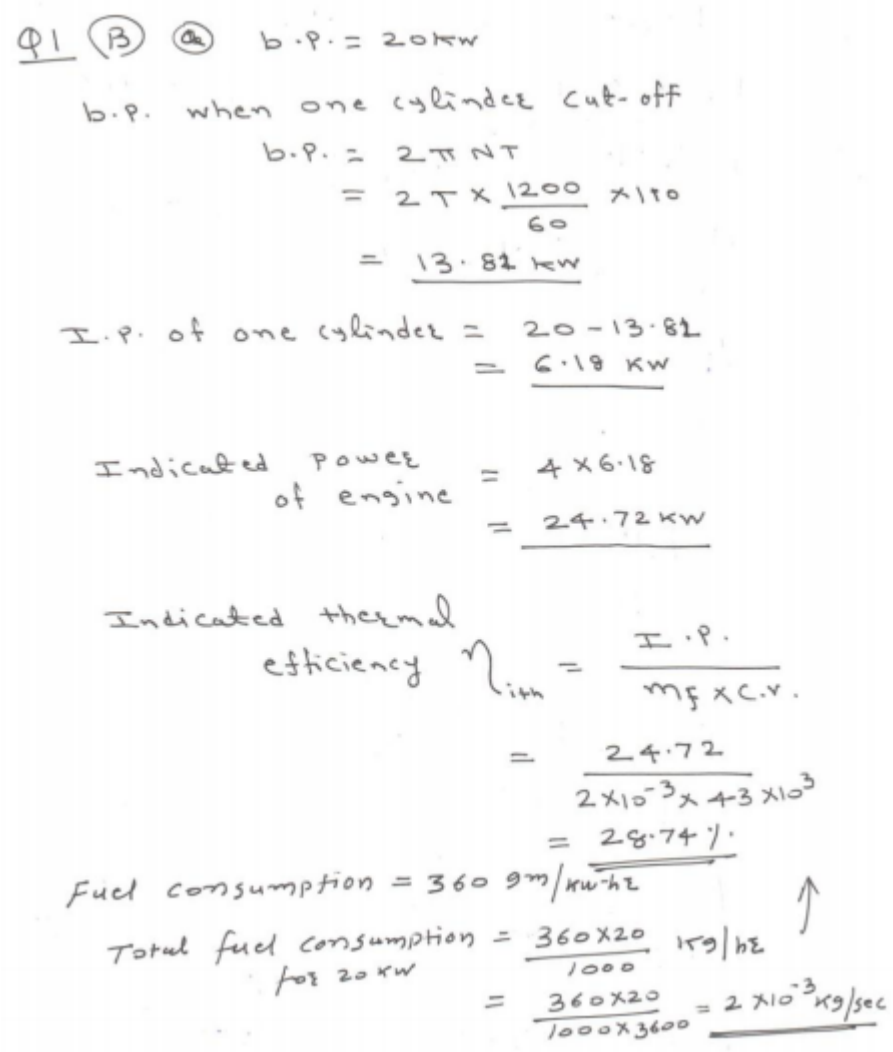
Differences between Vapour Absorption and Vapour Compression refrigeration system

No	Vapour Absorption system	Vapour Compression System
1.	Uses low grade energy like heat. Therefore, may be worked on exhaust systems from I.C engines, etc.	Using high-grade energy like mechanical work.
2.	Moving parts are only in the pump, which is a small element of the system. Hence operation is smooth.	Moving parts are in the compressor. Therefore, more wear, tear and noise.
3.	The system can work on lower evaporator pressures also without affecting the COP.	The COP decreases considerably with decrease in evaporator pressure.
4.	No effect of reducing the load on performance.	Performance is adversely affected at partial loads.
5.	Liquid traces of refrigerant present in piping at the exit of evaporator	Liquid traces in suction line may damage the compressor
6.	Automatic operation for controlling the capacity is easy.	It is difficult.
7	Charging of refrigerant is simple	Charging of refrigerant is difficult
8	Part load performance is low	No effect of variation of load

Explain with neat sketch working of non dispersive infra red (NDIR) gas analyser.

Non dispersive infra red gas analyzer (NDIR) : The working principle of infra red gas exhaust gas analyzer is as shown in figure . It works on the principle of hetero atomic gases absorbs infra red energy at distinct and separated wavelength. The absorbed energy raises the temperature and pressure of confined gas. This enables to measure contents of hydro carbon and carbon monoxide. This is a faster method of gas analysis. The standard sample is filled in reference cell R . the sample of gas under testing is filled in cell S .

A four cylinder engine running at 1200 rpm delivers 20 kW



Explain with neat sketch working of lobe type air compressor

Lobe type air compressor: it is a rotary type of compressor consisting of two rotors which are driven externally. One rotor is connected to drive and second is connected to gear. These two rotors have two or three lobes having epicycloids, hypocycloid or involutes profiles. In the figure two lobes compressor is shown with a inlet arrangement and receiver. A very small clearance is maintained between surfaces so that wear is prevented. Air leakage through this clearance

decreases efficiency of this compressor.

Pages

« first
‹ previous
...
12
13
14
15
16
17
18
19
20
...
next ›
last »