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Experiment No 1 Roll - 2211

→ AIM: Test on vapour compression test rig.

→ Problem Definition and Aim of Experiment: To find COP of vapour compression test rig.

→ Objective of Experiment:
1) To understand of vapour compression cycle.
2) To find out COP of vapour compression test rig.

→ INTRODUCTION:
Refrigeration and air conditioning systems find wide range of applications in the modern world. The refrigeration effect is produced either by vapour absorbtion cycle or vapour compression cycle. Vapour compression system considered here is almost widely used refrigeration system.

→ EXPERIMENTAL SETUP:
1) Compressor: Hermetically sealed type.
2) Air cooled condenser: Copper coils with fins and cooling fan.
3) Expansion device: Thermostatic expansion valve and capillary ~~tg~~ tube.
4) Evaporator: Copper coil immersed in water.
5) Rotameter: For measuring flow of refrigerant.
6) Energy meter: One each for measurement of power supply to the compressor and evaporator heater.
7). Dimmersat: To control power supply to heater.
8) Pressure gauge, Electric heater, Digital temperature indicator, Solenoid valve.

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9) HP and LP cutoff : Safety device suitable for the low and high pressure of compressor.

10) Service valve, Ammeter, Vaitmeter, Filter dryer, Thermosat, Switches. (For various controls.

→ PRECAUTIONS:

1) Before switching ON supply, see that all the switches on the panel board are off and the dimmer stats is a 'Zero' position.
2) The evaporator should contain adequate water.
3) Proper earthing is provided.
4) In case the supply fails while the trial is going on, put OFF the switches and also the dimmer stat.
5) Stabilised supply for the equipment is necessary for better performance and long life of the compressor.

→ CALCULATIONS:

1) Compressor Power (Watt) = $\frac{N_c \times 360}{t_c \times Emc(comp)}$

2) Heater Power (Natt) = $\frac{N_h \times 3600}{t_h \times Emc(Heater)}$

3) COP (act): = $\frac{Natt}{Watt}$

4). COP (relative): = $\frac{\text{Actual COP}}{\text{Theoretical C.O.P}}$

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→ TECHNICAL DATA:

1) Compressor Energy meter constant $(EMC)_{comp}$ = 3200 Pulse / kWhr

2) Heater Energy meter constant $(EMC)_h$ = 3200 Pulses / kWhr

→ SAMPLE OBSERVATION TABLE:

S.No.	HP PSi	LP PSi	Q LPH	T_{ci} °C	T_{co} °C	T_{ei} °C	T_{eo} °C	T_{bath} °C	t_c Sec	t_h Sec
1.	140	32	22	49	39	9	26	27	27.6	10.3
2.	142	40	25	43	39	11	25	27	26.0	10.1

→ HP: Condensor Pressure, T_{ci}: Refrigerant inlet Temp. T_{co}: Refrigerant Outlet temp, t_c: time for 10 pulses of Compressor energy meter in sec t_h:

→ CONCLUSION:
The actual COP is less than the theoretical COP due to the losses at various locations.

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EXPERIMENT NO - 2 Roll NO - 2211

→ AIM: Test on air conditioning test rig.

→ EXPERIMENT: To find different process such as Cooling Processes, Heating processes. Humidification Process, Heating and Humidification process.

→ Objective of Experiment:

1) To understand the air conditioning system.
2) To find out effect of different processes on air.

→ THEORY:

Air conditioning is a process of simultaneous control of temperature, humidity, purity, and velocity of air in a conditioned space for required purpose. The required indoor air condition parameters depends upon application eg comfort application or industrial application.

The basic air conditioning process are:

1) Heating
2) Cooling
3) Humidification
4) Dehumidification and various combinations of these.

→ EXPERIMENTAL SETUP:

1) Air intake system: It consists of a centrifugal blower and, which radically sucks in the ambient air.

2) Inlet Air Condition Measurement Section: The psychometric condition of incoming air is read by dry bulb and

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and wet bulb thermometers.

3) Conditioning Section: It comprises of the following

1) Cooling Unit: This is the evaporator section of a vapour compression system with R-22 as refrigerant. It is installed in the path of the incoming air.

2). Heating coil: This is fitted in the path of incoming air for sensible heating process.

3) Steam Generating Unit: A steam generator in the form of a pressure cooker is installed to generate steam.

4) Control Panel and Instrumentation:
The control panel consists of control switches for compressor, heater, steam generator, condenser fan etc. Cut off controls are provided for the compressor in case of high or low pressure goes beyond the ~~presor~~ prescribed limits.

5). Outlet Air Condition Measurement Section:
Air coming out of conditioning section enters here and flows over the dry and wet bulb thermometers fitted in the section to measure the outlet air condition parameters.

→ TECHNICAL DATA:

1) Cross-Section Area of Duct, $A = 0.25 \times 0.25\ m^2$

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2) Vapour Compression Refrigeration Test Rig specifications:
3) Energy meter Constant, $E_c = 1200$ rev / kWh
4) High pressure gauge = 0-15 psi for R-22 Refrigerant.
5) Low pressure gauge = 0-15 psi for R-22 Refrigerant.
6) Cooling unit = 2335 kcal / hr

→ CALCULATIONS:

1) Cooling Process: $q_o = (h_4 - h_3)$ kJ/kg
$W_c = [h_1 - h_4]$, kJ/kg

2) Actual COP = $\frac{q_o}{W_c}$ 2) Coil bypass factor = $\frac{[DBT_2 - T_S]}{[DBT_1 - T_S]}$

3) Heating Process: Volume flow rate of air
= $\dot{V} = A \cdot V$ (m^3/sec)
Heat absorbed by air $q_o = \dot{m}_{air}[h_2 - h_1]$ kW

4) Humidification Process:
1) Volume flow rate of air = $A \cdot V$ m^3/sec
2) Mass flow rate of air $\dot{m}_{air} = \frac{\dot{V}}{v}$ kg of dry air / sec

3) Moisture of air added = $\dot{m}_{air} V_a [W_2 - W_1]$ kg / kg of dry air.

5) Heating and Humidification process:

→ Heat absorbed by air = $\dot{m}_{air} \cdot C_p [DBT_2 - DBT_1]$ kW
→ Moisture added to air =
$\dot{m}_{air} \cdot V_a [W_2 - W_1]$ kg/kg of dry air.

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EXPERIMENT NO - 3

Roll No - 2211

→ AIM: Trial on single cylinder (constant speed) diesel engine at different loading conditions to evaluate performance and energy balance.

→ THEORY:

1) Theory of single cylinder, four stroke, and water cooled diesel engine.
2) Performance of an engine is to be checked by conducting trial on the engine.

The basic performance parameters of engine are:

1) Brake Power
2) Brake thermal and mechanical efficiency.
3) Torque and mean effective pressure.
4) Volumetric efficiency.
5) Air-fuel ratio.
6) Fuel consumption and brake specific fuel consumption.
7) Heat balance sheet.

→ EXPERIMENTAL SETUP:

1) The single cylinder Diesel engine is fitted with a centrifugal governor. Hence speed of the engine is constant irrespective of load on the engine.

2) The output of the engine is used to run an electrical generator. An electrical lamp bank is connected at the output of the generator.

3). Thermocouples are attached at various locations to measure respective temperatures. Temperatures are read by ~~mass~~ means of a digital temperature indicator.

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4). The engine is cooled by water circulated through water jackets. Arrangement is made for measuring the flow rate of water.

→ TECHNICAL DATA

→ Engine Specifications
1) Make : Kirloskar Oil Engines.
2) Type : 4 Stroke, Constant speed, Single Cylinder, Water cooled diesel Engine.
3) Stroke (L) : 110 mm
4) Bore (D) : 80 mm
5) Compression Ratio : 16:1
6) Rated output : 3.73 kW [5HP] @ 1500 rev/min

→ Generator Specifications:
1) Make : Kirloskar Electricals
2) Power : 5kVA
3) Speed : 1500 rev/min
4) Current and Voltage : 21.8A, 240V

→ 1) Lamp Bank = 18 bulbs each of 200W
2) Barometric reading $H_{Hg} = 0.72$ m of Hg
3) Density of mercury $\rho_{Hg} = 13.6 \times 10^3$ kg/m3
4) Gas constant $R = 0.287$ kJ/kgK
5) Specific gravity of fuel $CV = 44800$ kJ/kg
6) Cross-sectional area of orifice $A = \pi/4 \, d^2$ m^2
7) Coefficient of discharge of Orifice $Cd = 0.67$

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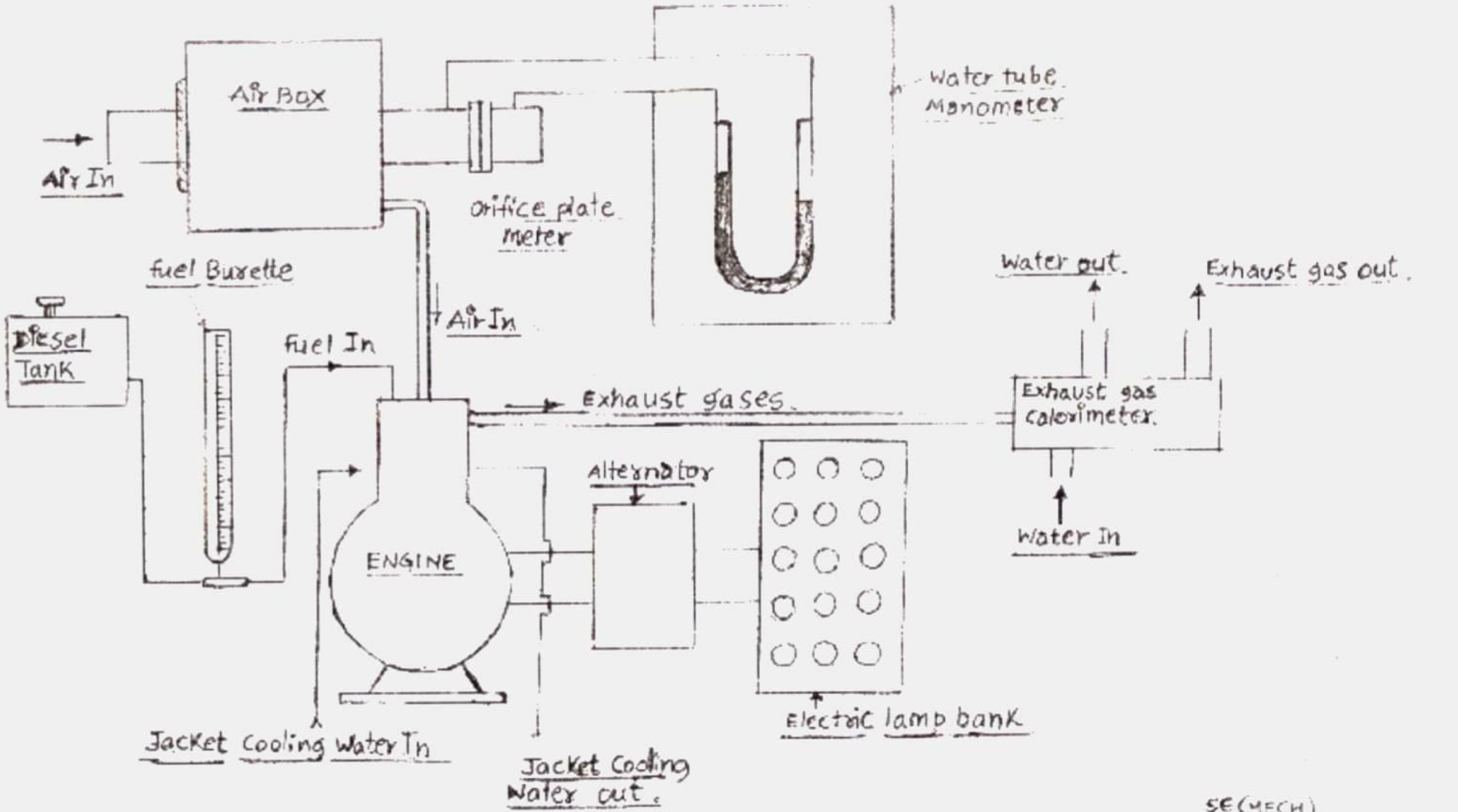
TRIAL ON SINGLE CYLINDER DIESEL ENGINE EXPERIMENTAL SET UP.



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8) Efficiency of Generator, $\eta_g = 80\%$ (Assumed)

→ PRECAUTIONS :

1) Before starting the engine check the following:
   → Fuel in the fuel tank
   → Lubricating Oil Level
   → No load on generator.

2) Never start the engine before starting the water supply to the exhaust gas calorimeter and engine water jacket.

3). Check that all bolts and nuts are tightened before starting.

→ CALCULATIONS:

1) Brake Power (BP) $= \frac{W}{\eta_g}$ kW

2) Mass flow rate of fuel $\dot{m}_f = \frac{M_f \times S}{60000}$ kg/S

3) Actual Mass flow rate intake air : $\dot{m}_a = \rho_a C_d A \sqrt{2gH_a}$ kg/S

4) Th Mass flow rate of intake air : $\dot{m}_{at} = \rho_a . \frac{\pi D^2 L}{4} \frac{N}{2 \times 60}$ kg/S

5) Volumetric efficiency $\eta_v = \frac{\dot{m}_a}{\dot{m}_{at}} \times 100\%$

6) Heat Carried away by exhaust gas $= \frac{\dot{m}_w \cdot C_{pw} [T_4 - T_3][T_1 - T_{a_1}]}{[T_1 - T_2]}$ kJ/s

7) Heat Carried away by jacket cooling water
$= \dot{m}_{jw} \cdot C_{pw} \cdot [T_6 - T_5]$ kJ/s

8) Mechanical Efficiency $= \eta_m = \frac{B.P}{I.P} = \frac{B.P}{[BBP - F.P]} \cancel{\times}\ \%$

EXPERIMENT No-4 Roll No-2211

→ AIM: Trial on Variable Compression ration engine.
(To conduct a variable load trial on VCR engine)

→ THEORY:
This is a single cylinder Diesel engine with an arrangement provided for varying its compression ratio. Also the engine is equipped with a computrized data acquisition system. Data acquisition, analysis and presentation of resultsis is done automatically with the help of embedded sof software 'IC Engine soft'.

→ EXPERIMENTAL SET-UP:
This is a variable compression ratio engine fitted with a dynamic pressure sensor to measure the dynamic pressure (P) inside the engine cylinder

→ The crankshaft of the engine is fitted with a crank angle sensor for measuring crank rotational angle(θ)

→ The entire engine test rig is equipped with various types of sensors like temperature sensors, speed sensors, fuel measurement system, time sensors and two rotameters.

→ Eddy current dynamometer is provided to measure the BP of the engine.

→ Analysis of the data a&' as well as plotting of results in number form and graphical form done by the software.

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→ PRECAUTIONS:

1) Before starting the engine check the following:
   1) Fuel in the fuel tank
   2) Lubricating Oil lever
   3) No load on engine

2) Never start the engine before starting the water supply to the exhaust gas calorimeter and engine water jacket.

3) Check that all nuts and bolts are tightened before starting.

→ Observations:

1) Click on 'combustion' mode. P-θ diagram as well as PV diagram can be viewed and printed.

2) View different observation tables and graphs generated by means of various sensors and software 'ICE Engine soft'. These include graphs of BP, IP, FP vs load, various efficiencies vs load, heat balance sheet, air and fuel flow vs load, etc.

→ Conclusion:

Observe different regimes of these diagrams and write the conclusions based upon the graphs and other datas.

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EXPERIMENT No - 5

Roll No - 2211

→ AIM: Determination of friction power of multi cylinder petrol engine by conducting Morse test.

→ THEORY:

1) This is a 4 cylinder SI engine.
2) Heat is generated by combustion of fuel. Indicated power (IP) is the power available at the piston of the engine. (BP) is the power available at the crankshaft of the engine.
3) FP is dependent on the speed of the engine.
4) BP of the engine is measured at a particular throttle position and speed when all 4 cylinders are firing. Then each of the cylinder is cut off (one at a time).
5) The cutoff cylinder does not produce IP. This reduce the IP as well as BP of the engine. This brings down the rpm speed of the engine too.
6) The procedure is repeated by cutting off all the cylinders one by one.

→ EXPERIMENTAL SET-UP:

Morse test is applicable only to multi-cylinder engines (4 cylinders in this case). Arrangement is provided on the test rig to 'cut off' each of the cylinders one by one. This cuts off spark plug connection to a particular cylinder in case of an SI engine and it cuts off the fuel supply to a particular cylinder in case of a CI engine.

Hydraulic dynamometer is provided to measure the brake power. Water supply is provided

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i) for cooling of engine and ii) for circulation through hydraulic dynamometer.
Speed measurement is made by tachometer.

→ TECHNICAL DATA:

1) Make: Tata Motors, [India - Petrol]
2) Type: 475 SA, Water Cooled, Multipoint fuel Injection System.
3) No of Cylinders: 4 in-line.
4) Piston Displacement: 1405 m^3
5) Stroke: 79.5 mm
6) Bore: 75 mm
7) Compression Ratio: 9:5:1
8) Maximum Output: 75 PS @ 5500 rev/min
9) Maximum Torque: 110 Nm @ 3000 rev/min
10) Firing Order: 1-3-4-2

1) Coefficient of discharge for orifice, Cd = 0.62
2) Diameter of Orifice, D = 26 mm
3) Densite of air, ~~ρ~~ ρ = 1.178 kg/m^3
4) Engine type = 4 stroke
5) Specific gravity of fuel, s = 0.74
6) Calorific value of fuel, CV = 48000 kJ/kg

→ ~~PROCEDURE~~: PRECAUTIONS:

1) Before starting the engine check the following:
→ Fuel in the fuel tank
→ Lubricating oil level
→ No load on dynamometer

2) Never start the engine before starting the water supply to the exhaust gas calorimeter and engine water jacket.

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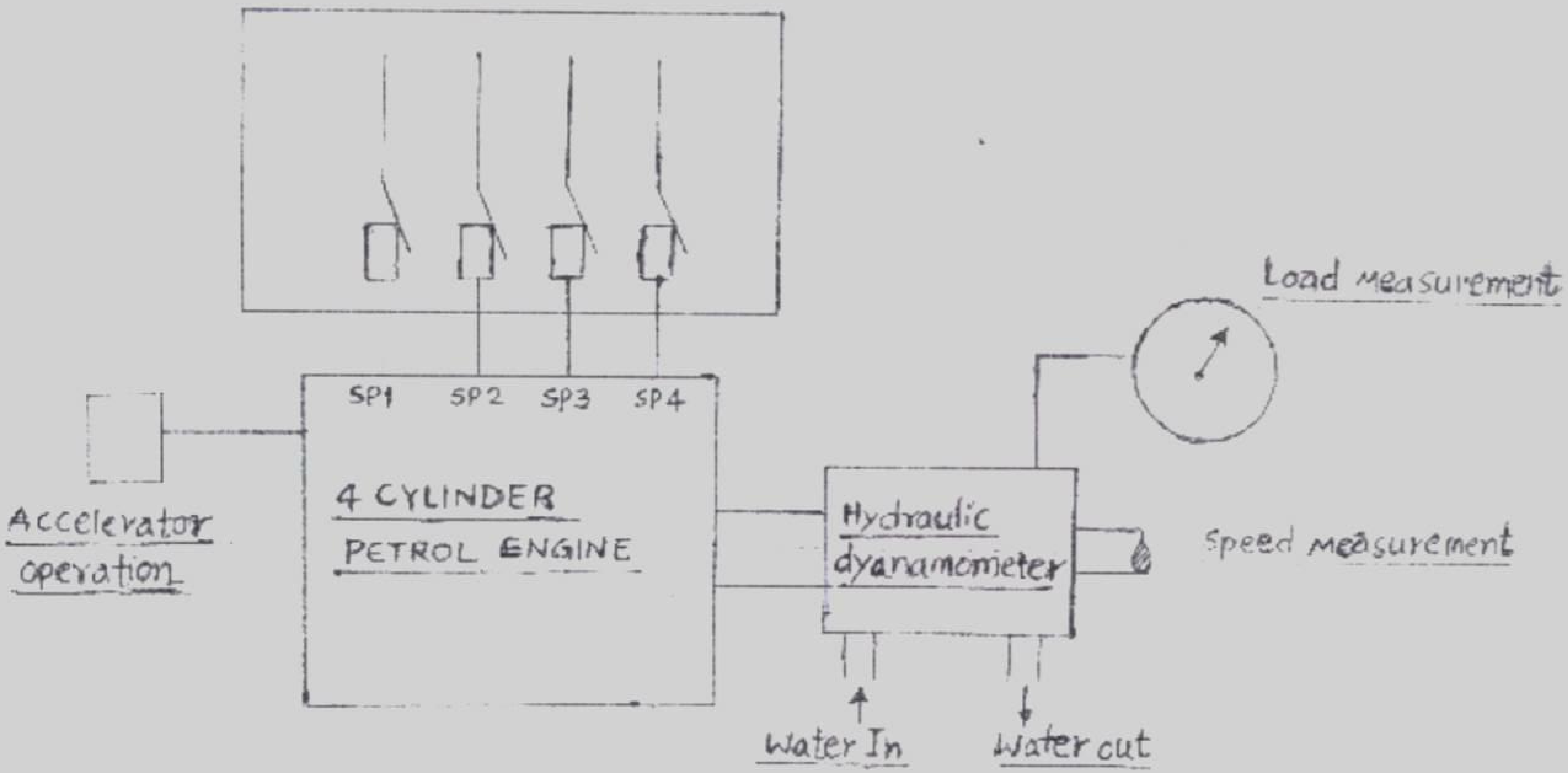
MORSE TEST : 4 CYLINDER PETROL ENGINE EXPERIMENTAL SET UP.



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3) Check that all bolts and nuts are tightened before starting.

→ CALCULATIONS:

1) Brake power, $(BP) = \frac{W \cdot N}{2000} \times 0.746$ kW

where W = Load in kg and N = Speed in rev/min

2) Brake Power Measurement:

$BP_1 = \frac{W_1 N}{2000} \times 0.746$ kW $\quad BP_2 = \frac{W_2 N}{2000} \times 0.746$ kW

$BP_3 = \frac{W_3 N}{2000} \times 0.746$ kW $\quad BP_4 = \frac{W_4 N}{2000} \times 0.746$ kW

3) Indicated Power Measurement:

$IP_1 + IP_2 + IP_3 + IP_4 = BP + FP$ (All cylinders firing)

4) Total Friction power of the Engine $FP = IP - BP$ (kW)

5) Mechanical Efficiency, $\eta_m = \frac{BP}{IP} \times 100$ %

→ CONCLUSION:

Write the value of FP and mechanical efficiency at the speed at which engine is run.

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EXPERIMENT No-6

Roll No-2211

→ AIM: Test on Positive displacement Air Compressor.

→ THEORY:

1) Describe in short, the working of a reciprocating air compressor. Also describe the need for its multi-staging.

2) Write about the constructional details of a ~~s~~ two stage reciprocating air compressor.

3) Performance parameters of the air compressors are:

→ Isothermal Efficiency.

→ Volumetric Efficiency.

→ Mechanical Efficiency.

→ Free Air delivered.

→ EXPERIMENTAL SET-UP:

1) The set up consists of a 2 stage reciprocating air compressor provided with water cooled intercooler arrangement.

2) The compressor is run by an electric motor by means of a belt drive.

3) Built in fins are provided for cooling of outer surfaces of first and second stage cylinders of the compressors.

4) Flow rate of incoming atmospheric air is measured by means of an orifice meter provided at the inlet of the compressor.

5) Flow rate of incoming atmospheric air is measured by. ~~m~~ A water tube manometer is provided to measure the pressure on upstream and downstream sides of the orifice plate.

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6) Compressed air coming out of the second stage cylinder is stored in a storage tank.

7) Delivery pressure of air is measured by means of a pressure gauge fitted over the delivery tank.

8) Temperatures at the various locations are measured by means of thermocouples and indicated on a digital temperature indicator.

→ TECHNICAL DATA:

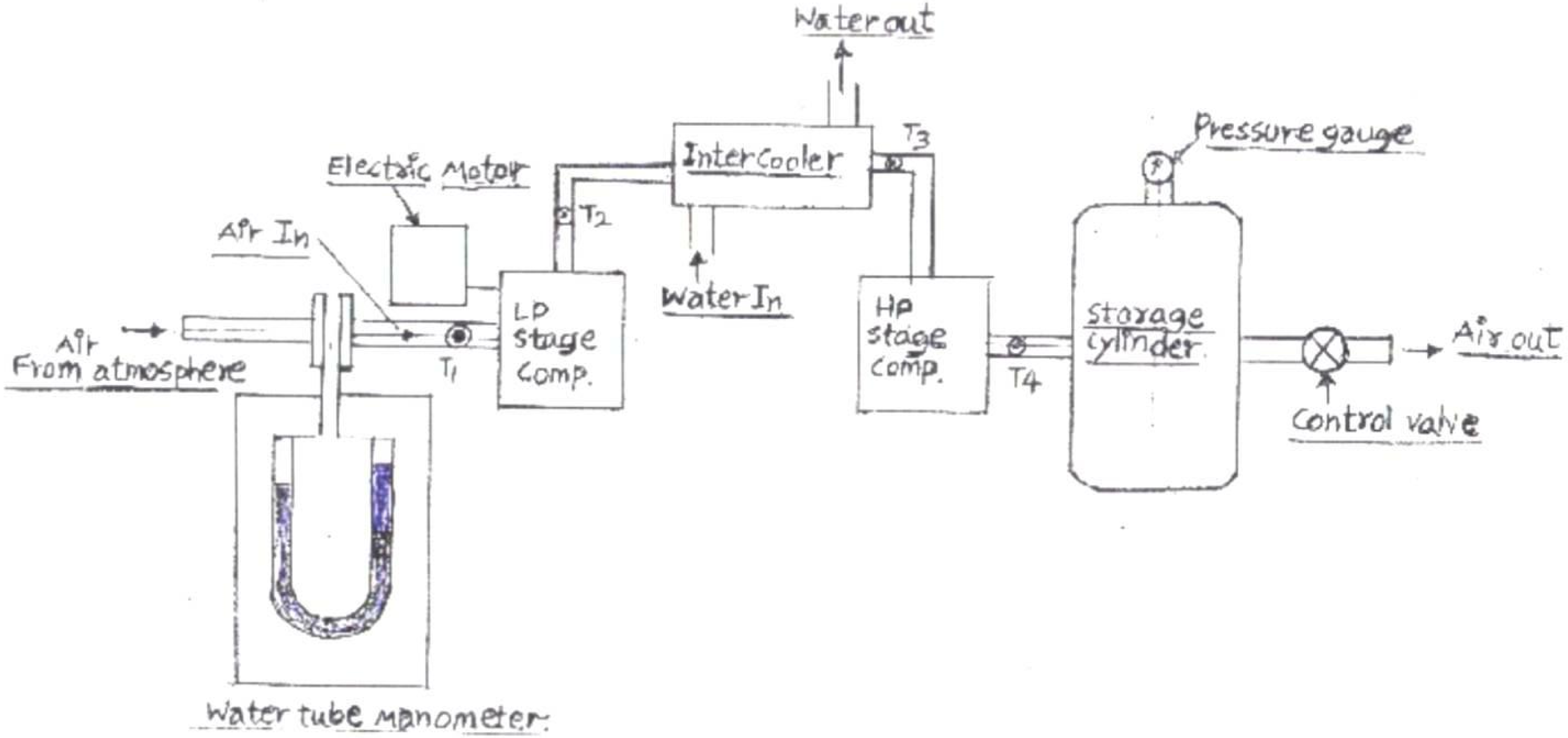
1) Make: Air-O-Matic
2) Type: Two stage, Reciprocating Compressor
3) Stroke, L: 85.4 mm
4) Bore, L.P, D_1: 79.5 mm
5) Bore, H.P, D_2: 63 mm
6) Maximum Output: 5.6 kW
7) Motor speed N: 800 rev/min
8) Transmission ratio: 1:1.8

→ PRECAUTION:

1) At the end of the experiment the outlet valve at the reservoir should be opened so as to let the compressed stored air out.

2) The compressor should be started at low pressure, to prevent undue load on the piston.

TEST ON POSITIVE DISPLACEMENT AIR COMPRESSOR



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→ CALCULATIONS :

1) Speed of compressor, $N_c = \frac{N}{1.8}$ rev/min

2) $\rho_a = \frac{P_a}{R \times T_a}$ kg/m³ where $R = 0.287$ kJ/kgK

3) Head causing air flow $H_a = \frac{\rho_w}{\rho_a} \times H_w$ m of air.

4) Actual volume of air compressed at room temperature and pressure
$V_a = C_d \times A \times \sqrt{2gH_a}$ m³/sec

5) Theoretical volume of air $V_t = \frac{\pi D_1^2}{4} \times L \times \frac{N_c}{60}$ m³/sec

6) Volumetric efficiency $\eta_v = \frac{V_a}{V_t} \times 100\%$

7) Motor input $= \frac{3600 \times n}{T_{avg} \times E_c}$ (kW).

8) Isothermal Work done $WD_i = \frac{P_a V_a \cdot \ln[P_R]}{1000}$ kW

9) Isothermal Efficiency, $\eta_i = \frac{WD_i}{I/P_c} \times 100\%$

→ CONCLUSION :

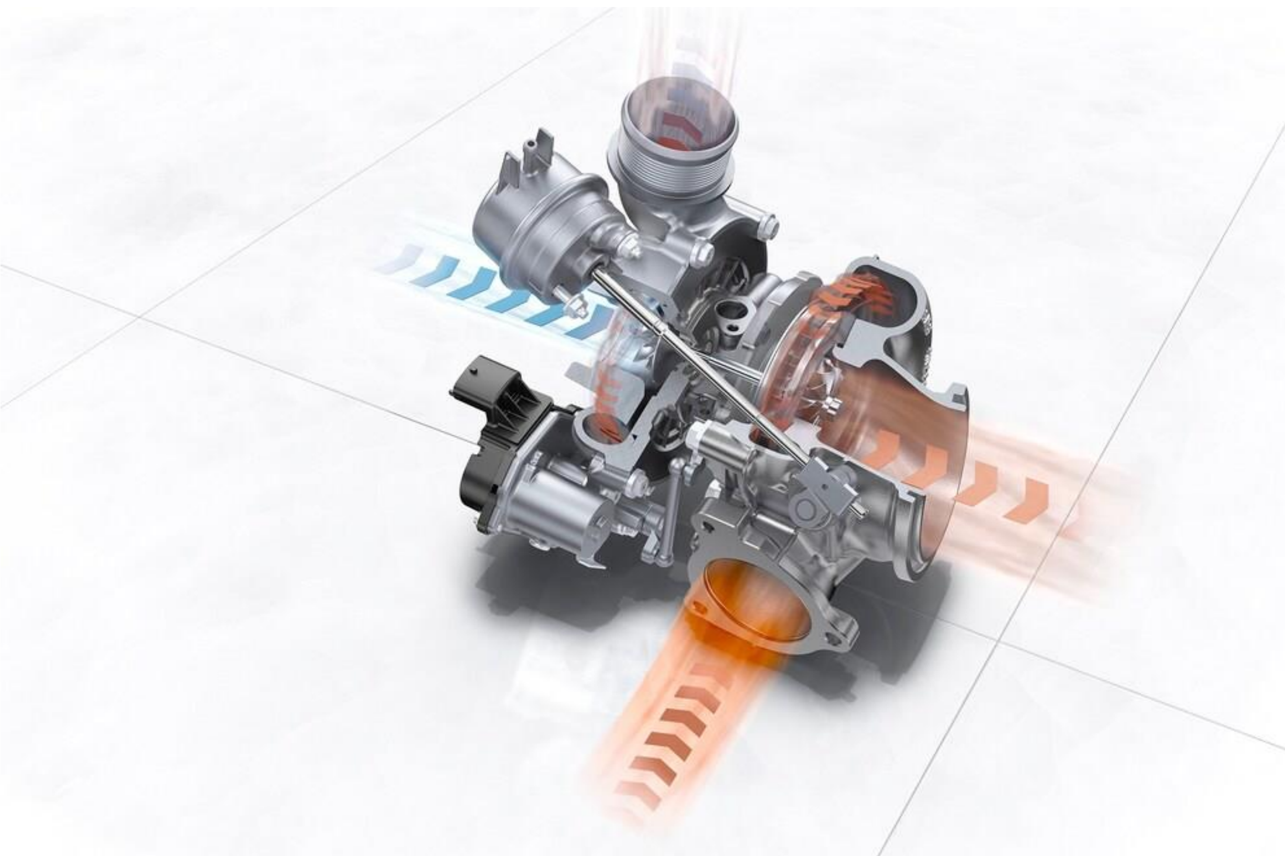
Write the conclusions based on the graphs and the given data.

TURBOCHARGER AND SUPERCHARGER

Name:Arindam Dey Roll:2211 Batch:A

What's The Difference Between A Turbocharger And A Supercharger?

"Supercharger" is the generic term for an air compressor used to increase the pressure or density of air entering an engine, providing more oxygen with which to burn fuel. The earliest superchargers were all driven by power taken from the crankshaft, typically by gear, belt, or chain. A turbocharger is simply a supercharger that is powered instead by a turbine in the exhaust stream. The first of these, dating to 1915, were referred to as turbosuperchargers and were employed on radial aircraft engines to boost their power in the thinner air found at higher altitudes. That name was first shortened to turbocharger and then to turbo.



Which Is Better: Turbo- Or Supercharger?

Each can be used to increase power, fuel economy, or both, and each has pros and cons. Turbochargers capitalize on some of the "free" energy that would otherwise be completely lost in the exhaust. Driving the turbine does increase exhaust backpressure, which exerts some load on the engine, but the net loss tends to be less by comparison with the direct mechanical load that driving a supercharger involves (the biggest blowers powering a top-fuel dragster consume 900 crankshaft horsepower in an engine rated at 7,500 total horsepower). But superchargers can provide their boost almost instantly, whereas turbochargers typically suffer some response lag while the exhaust pressure required to spin the turbine builds. Clearly a top-fuel dragster trying to run the quarter in four seconds has no time to waste waiting for exhaust pressure to build, so they all use superchargers, while vehicles tasked with boosting a company's corporate average fuel economy (CAFE) can't afford to squander precious horsepower on blowers, so they mostly use turbos. But with the rise of mild hybridization and 48-volt electrical systems, you can expect to see greater use of superchargers driven by freely recuperated electricity stored during deceleration and braking. Mercedes-Benz's new M256 six-cylinder now arriving in vehicles like the CLS 450 and GLE 450 uses just such a system, as does the similarly sized and configured range-topping engine in the new Land Rover Defender.

How Much Power Does A Turbo Or Supercharger Add?

Above we noted that the amount of oxygen that an engine can "breathe" is the limiting factor as to how much power it can produce, because fuel-injector technology is more than capable of supplying as much fuel as can possibly be burned with the amount of oxygen in the cylinder. Naturally aspirated engines operating at sea level get air at 14.7 psi, so if a turbo or supercharger adds 7 psi of boost to an engine, then the cylinders themselves are getting roughly 50 percent more air and should theoretically be able to produce about 50 percent more power. It doesn't usually work out that way. Compressing intake air adds heat, which along with the added pressure increases the likelihood of engine-damaging pre-detonation or "ping," so the timing often has to be retarded somewhat. This can limit the amount of time the fuel has to completely burn, and hence erodes some of the power gain. Most modern engines running turbos and/or superchargers also include intercoolers to help remove some of the heat added by the turbo or supercharger. In the end, the typical expectation is that adding 50 percent more air yields 30 to 40 percent more power.

How Do Turbos/Superchargers Save Gas?

When they're working, turbos and superchargers mostly help to burn *more* gas, but when they're bolted to an engine that would otherwise be too small to adequately meet the vehicle's needs in terms of acceleration or when towing, etc., they help save gas during the low-power cruising that comprises most of our driving. One of the ways this happens is by reducing the pumping losses that occur when a big-displacement engine is running at five percent throttle or less—it must work hard to suck air past a mostly closed throttle. That same amount of power might require a 20 percent throttle opening on the smaller engine, which results in less pumping work. (This is why many newer cars don't create enough vacuum to run power brakes, climate-control systems' blendair doors, etc., and either feature auxiliary vacuum pumps or use electric controls for these items.)

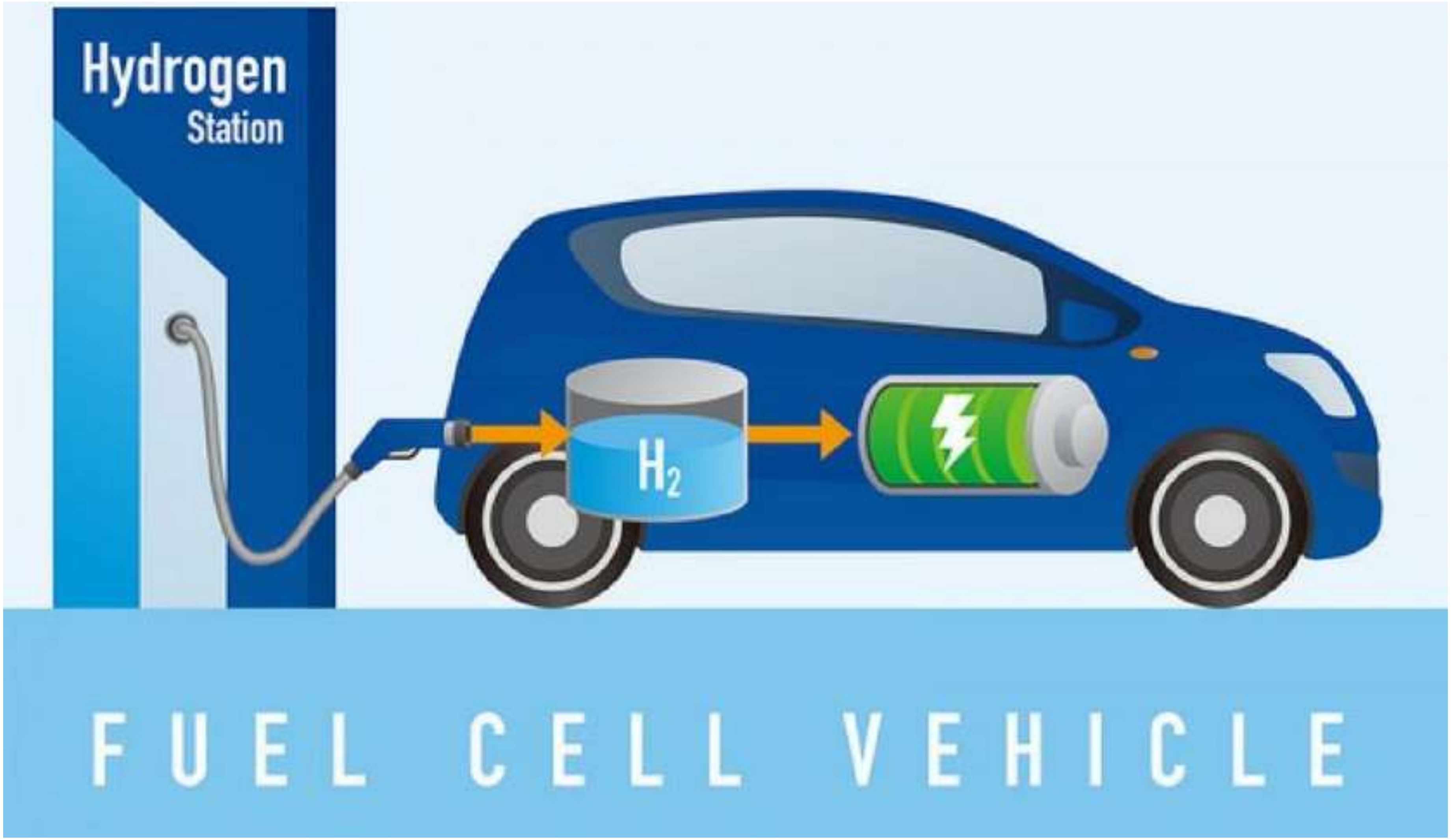
Why Are Turbos More Popular Than Superchargers In Production Vehicles?

Turbos tend to outperform crank-driven superchargers on the critical FTP75 fuel-economy test that determines the window-sticker mpg numbers and a corporations CAFE rating, so turbos are found on more mainstream vehicles ranging from the $21,240 Ford EcoSport 1.0-liter turbo to any of the four turbocharged engine offerings in the Ford F-150 pickup. Meanwhile, as this list of every supercharged vehicle available in the U.S. indicates, superchargers are mostly fitted to high-performance vehicles. Of course, all Volvos equipped with 2.0-liter twincharged engines like the XC60 and XC90 T6 and T8 models feature both a turbocharger *and* a supercharger. This design capitalizes on the strengths of each—supercharger boost at low rpm supplies pressure until the larger turbo spools up, at which point the supercharger is declutched from the crankshaft so as not to rob power.

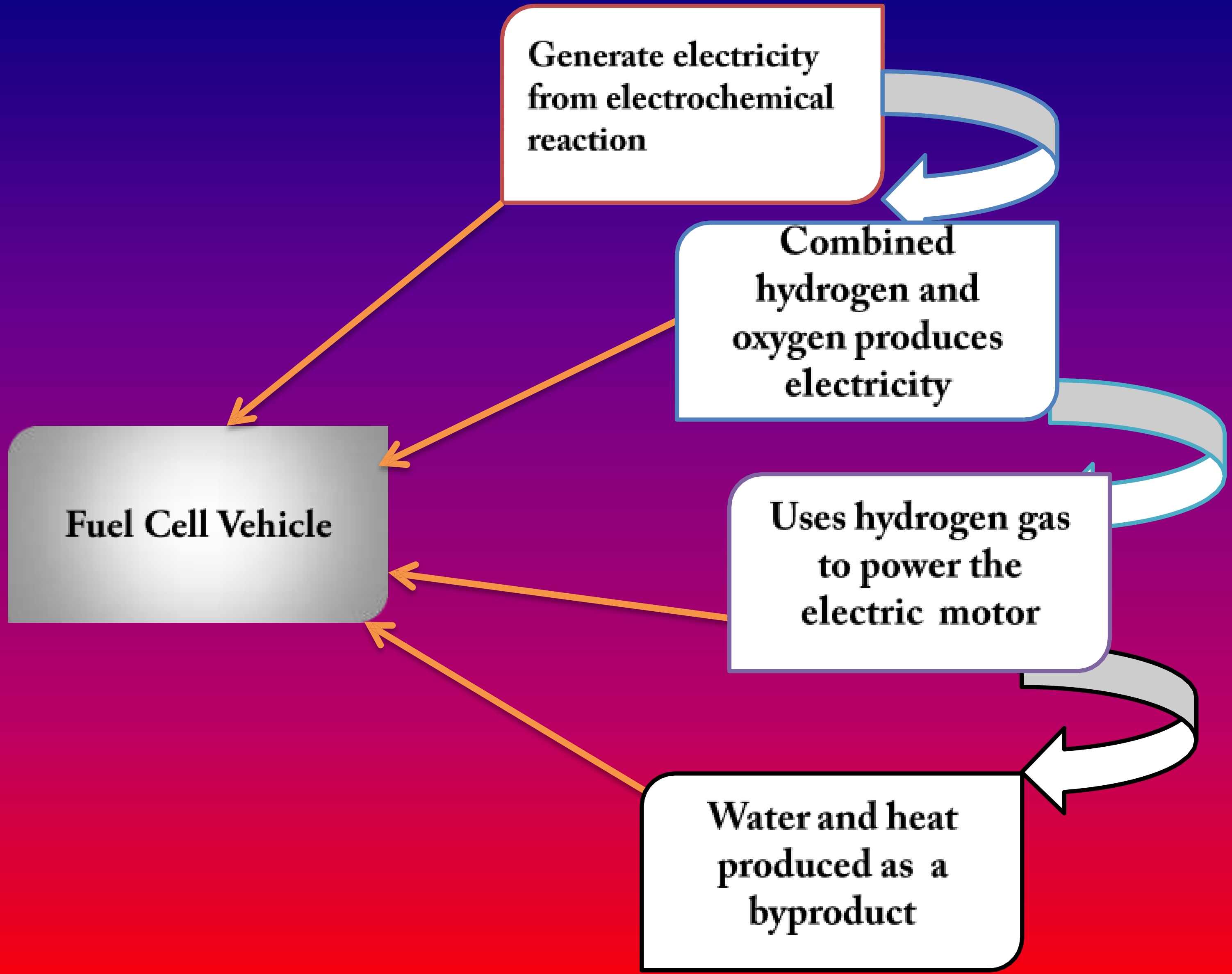
What Are The Different Types Of Supercharger?

Because of the need to package a turbocharger near the exhaust, its form factor leaned toward a centrifugal (turbine-type) compressor from the beginning. Belt-driven centrifugal superchargers are also available and are likewise fairly easy to package in aftermarket retrofit installations. Paxton popularized this setup, and its design is now sold under the Vortech name (as seen above). One interesting riff on this concept is a variable-ratio centrifugal supercharger, which involves a continuously variable pulley drive fitted to a conventional compressor. Factory superchargers on vee-type engines are usually packaged in the valley of the vee, and hence favor longer, lower, narrower packaging. Of these, the Roots type is most popular among factory supercharged cars, which include the new Ford Mustang Shelby GT500 and Camaro ZL1. In this setup, two counterrotating shafts have lobes that force air down across the shafts—typically air enters the top of the unit and exits the bottom. Lysholm twin-screw superchargers force air from one end to the other of the supercharger. The early-2000s vintage Ford GT used this type, as did the Mazda Millenia's Miller-cycle engine.

FUEL CELL VEHICLE



BY : ARINDAM DEY
ROLL : 2211 BATCH : A


Generate electricity from electrochemical reaction
Combined hydrogen and oxygen produces electricity
Uses hydrogen gas to power the electric motor
Water and heat produced as a byproduct
Fuel Cell Vehicle

How Fuel Cell Vehicle is Different From Other Hybrid Vehicles..???

BEV
(Battery Electric Vehicle)

Battery Electric Vehicle

- Run with the help of electric Motor and Battery
- Uses Renewal energy sources
- And emit less emission

Fuel Cell Vehicle

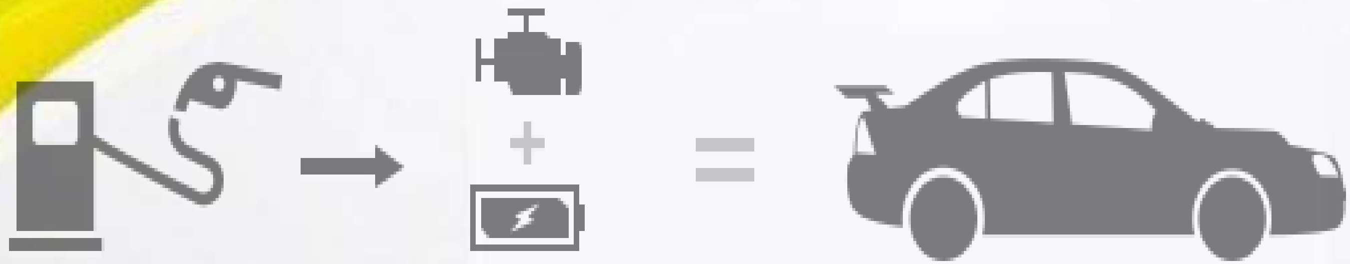
- Run by electric Motor and Battery
- Use existing infrastructure for recharging but also use plugged in for long time use
- Emit less emission than BEV

Plug-in hybrid electric vehicles

Plugin hybrid looks similar to battery vehicle, but have a gasoline engine for long convention

Also emits more CO_2 than battery vehicle

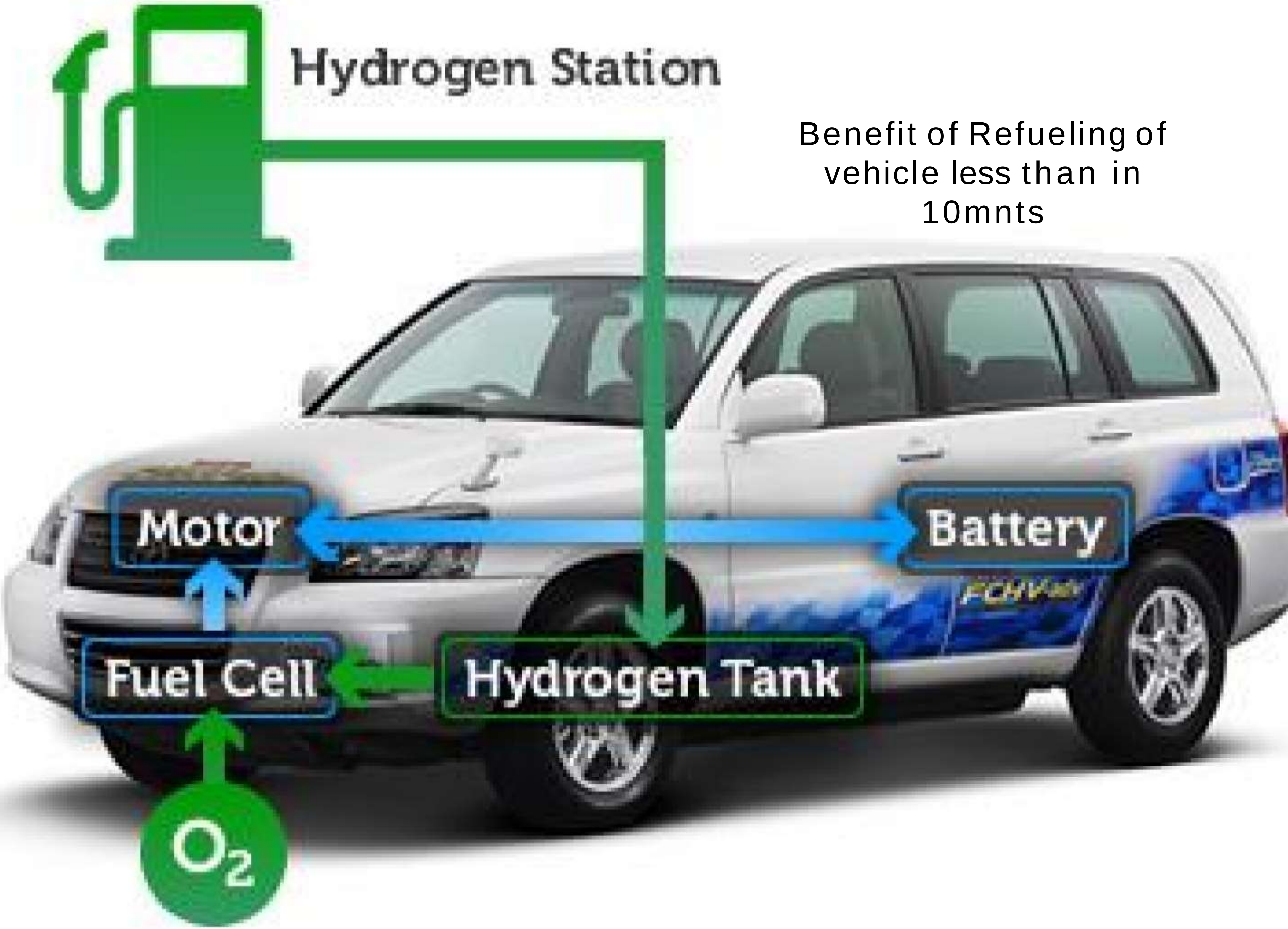
Conventional hybrids



Conventional vehicle have engine, electric motor but can’t be pluged in like battery vehicle

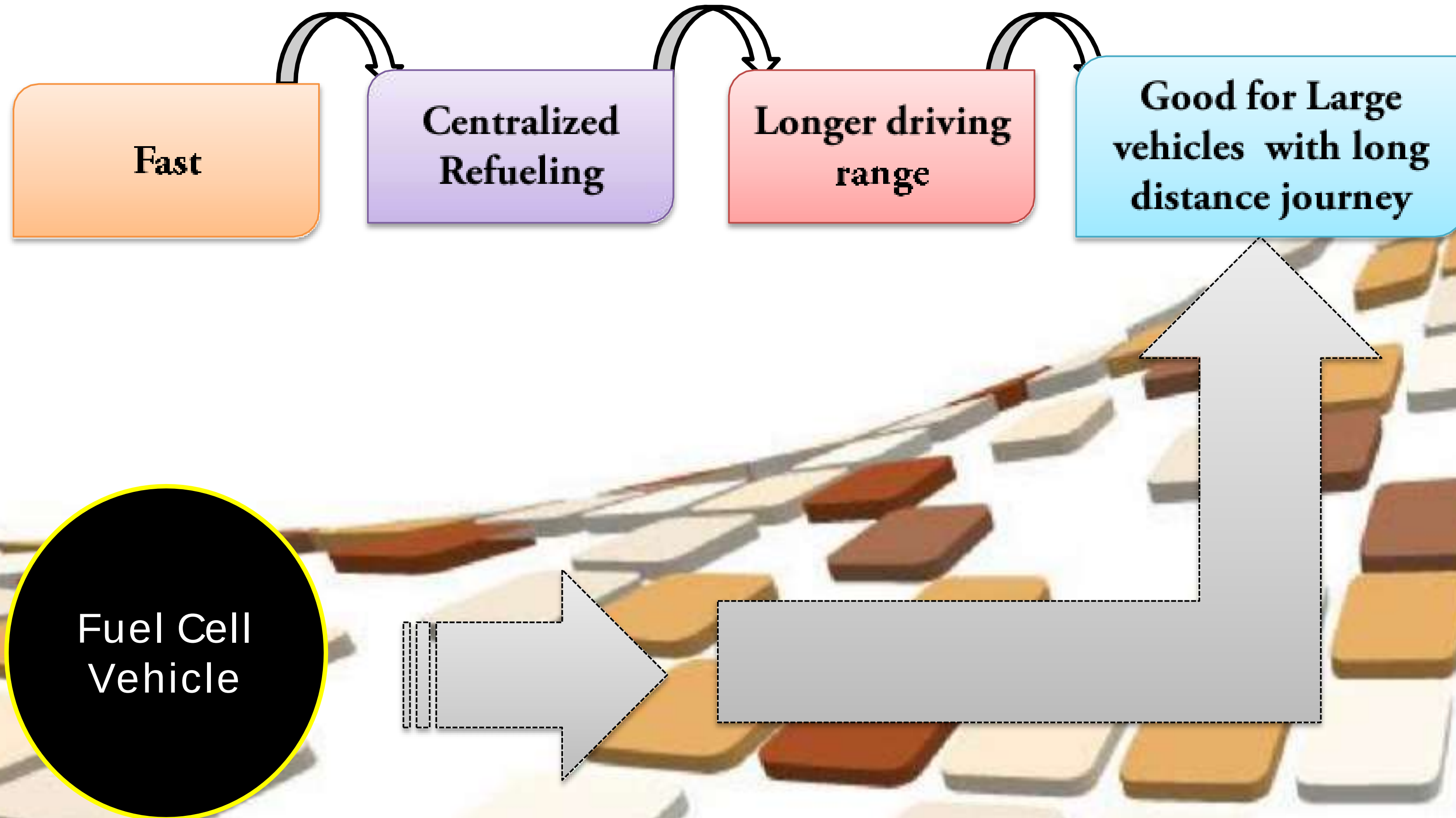
Release less emission to environment still more than battery vehicle

What Are The features Of Fuel Cell Vehicle..???



Benefit of Refueling of vehicle less than in 10mnts

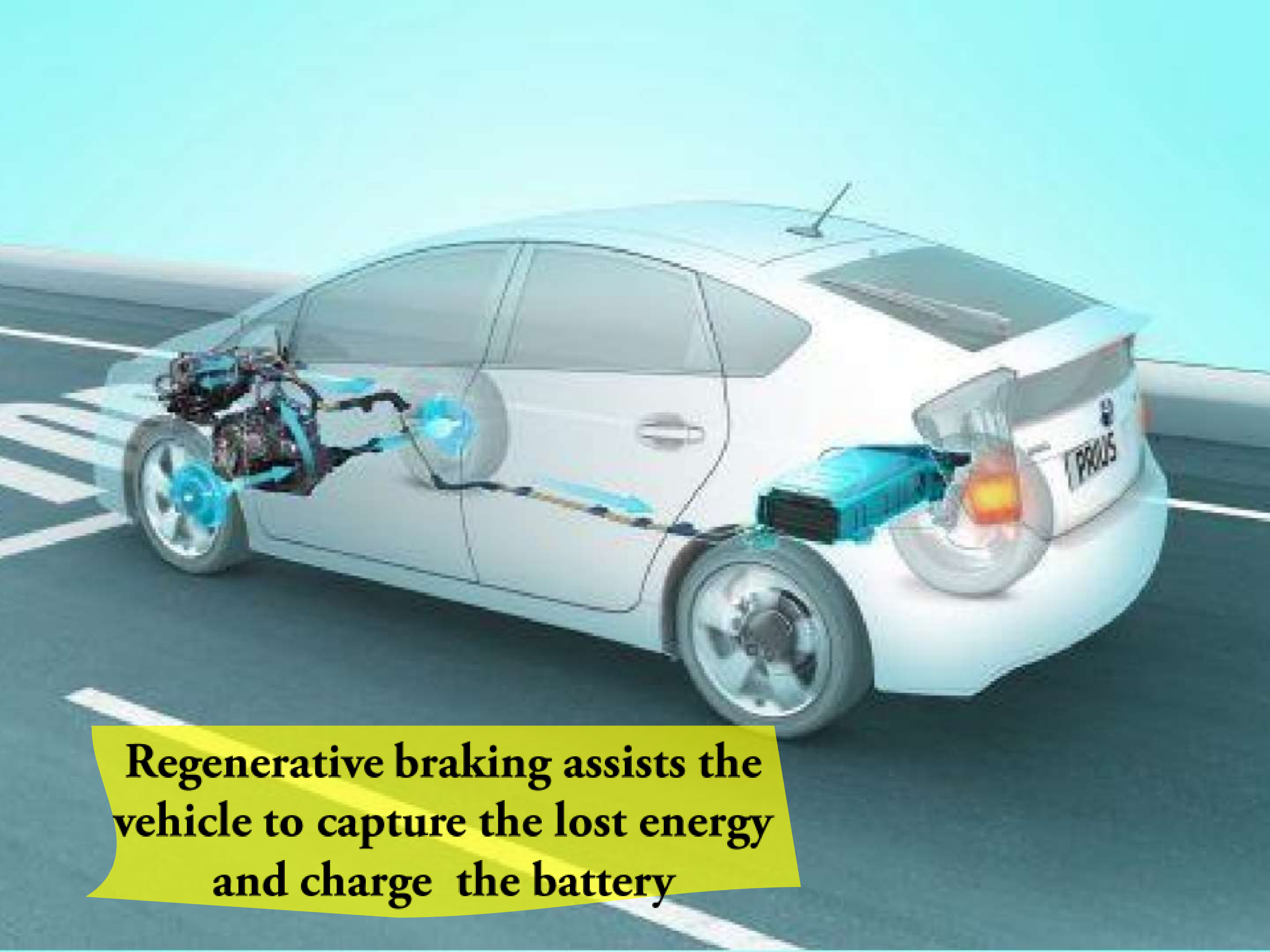
Deliver an exact Mileage like gasoline vehicles 200-300 miles


Fast
Centralized Refueling
Longer driving range
Good for Large vehicles with long distance journey
Fuel Cell Vehicle

Idle Off Technology

:

Shuts Down the cell at time of Vehicle idling or in stop signs or in traffic


PRIUS
Regenerative braking assists the vehicle to capture the lost energy and charge the battery

Let’s Know About The Feasibility

Readily Available :

Hydrogen is readily available
without any effort or pay

No Harm Full Emission :-

Leaves only water and heat as a byproduct

Less
Green
House
Gas
emission

Reduction in
Oil
Dependency

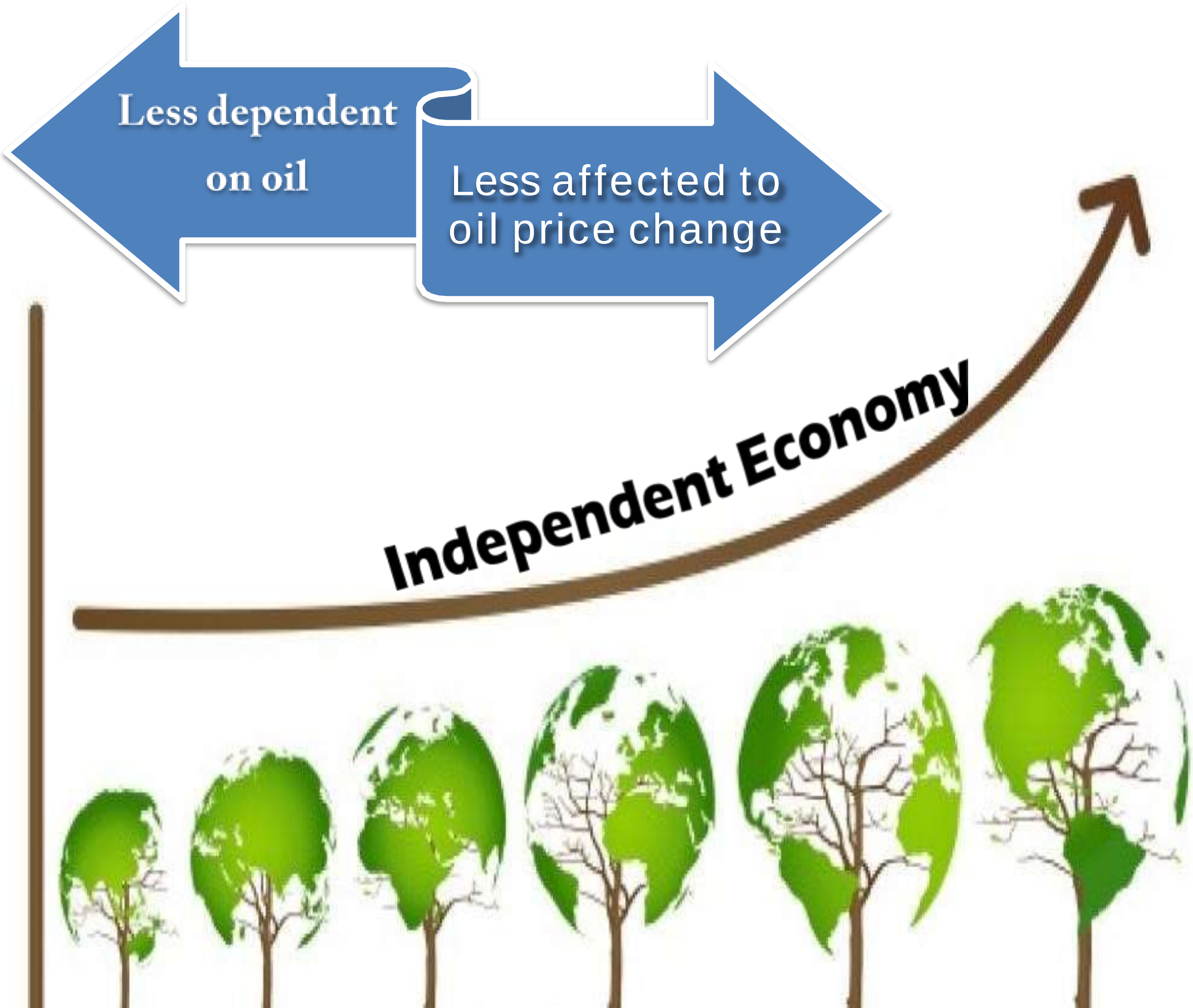
……….How ???

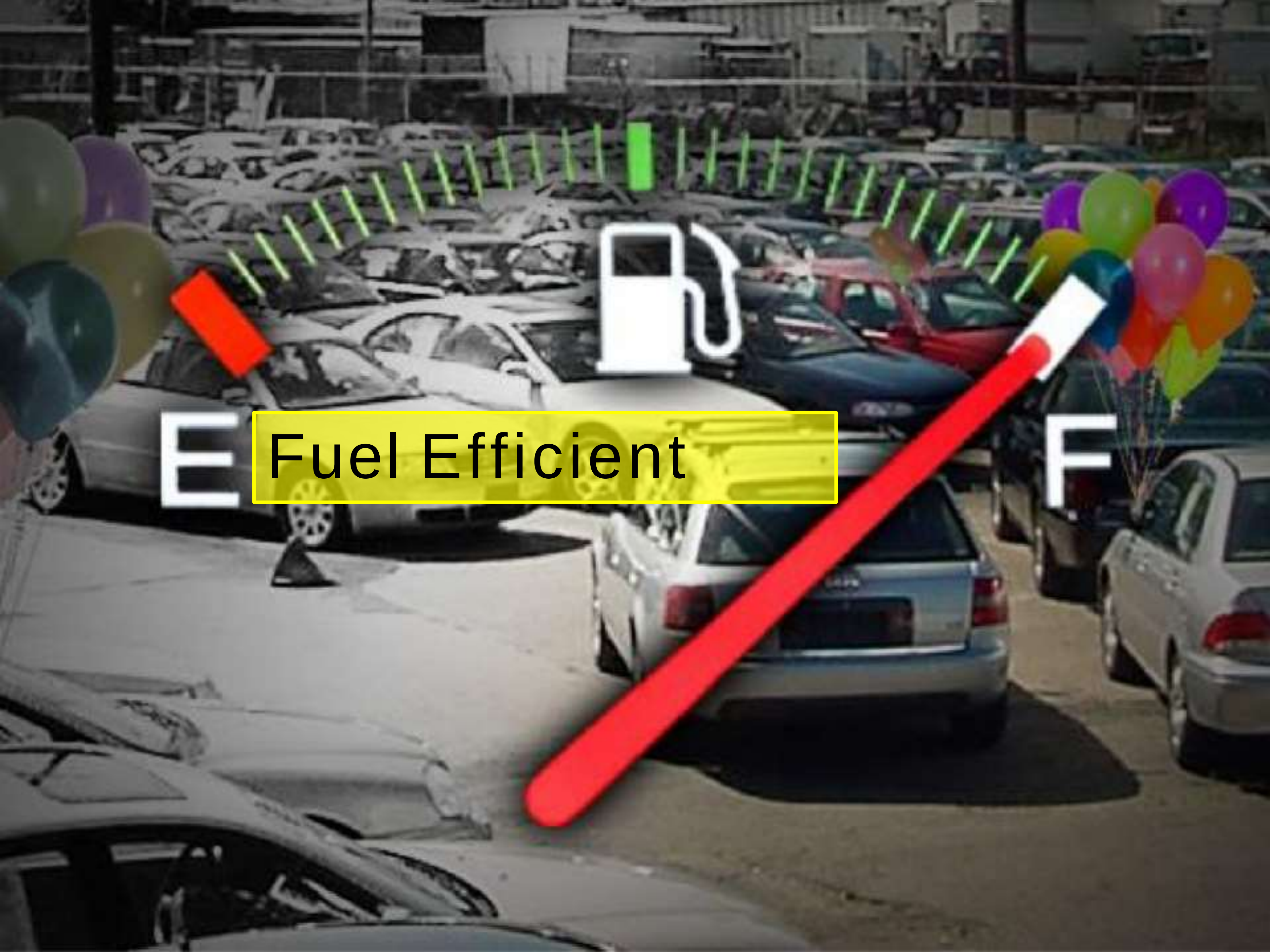
Hydrogen Procurement

Domestic Sources

Natural Gas and coal

Renewable Resources → Water → Biogas → Agricultural waste


Less dependent on oil
Less affected to oil price change
Independent Economy


E
Fuel Efficient
F

Most efficient fuel source of energy

More energy produced in a single pound of fuel

Fuel Cell vehicle gives more mileage than others

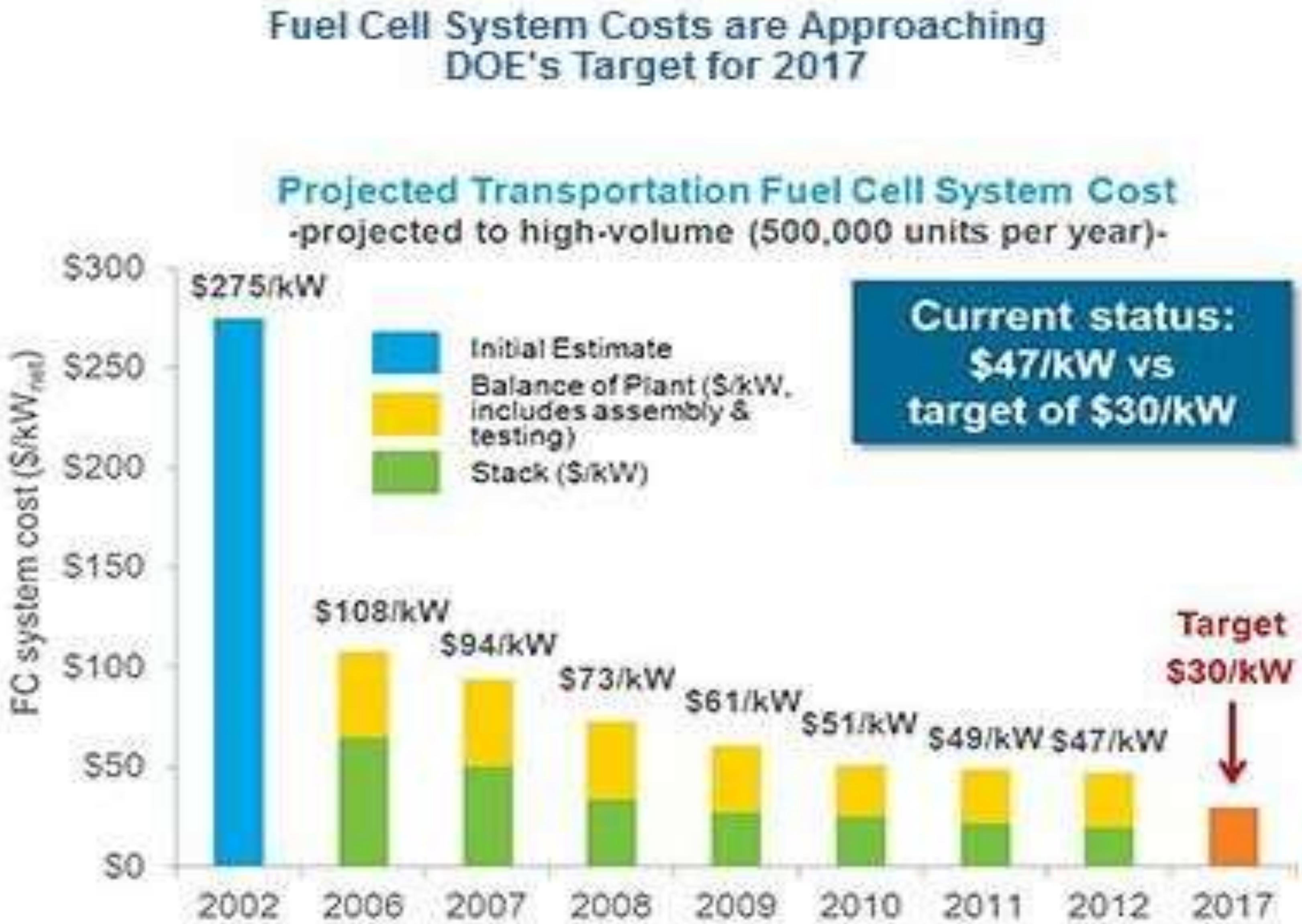
Renewable Source of Energy

Hydrogen energy can be produced unlimitedly

Just need fossil fuel that breaks the water and separate it from oxygen

The most Important Loopholes Of Fuel Cell Vehicle…

Most Expensive than
conventional or Hybrid



USDOE, Fuel Cell Technologies Office, Accomplishments and Progress.

Storage Of Hydrogen for further use is very much tough work and very expensive also

Very rare or no availability of vehicle Spare parts for replacement

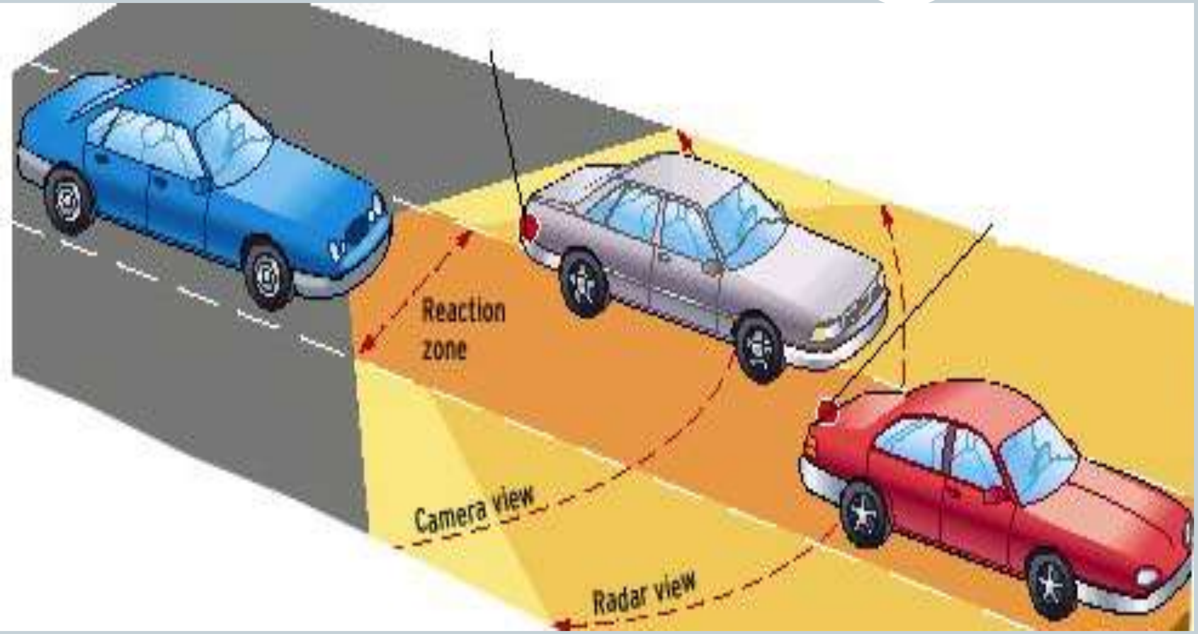
Highly Flammable In itself …Risk of Accident is high

High Dependency On Fossil Fuel that will separate it from Oxygen

THANK YOU

for your attention!

‘Adaptive Cruise Control System’



By : Arindam Dey
Roll No: 2211
Batch: A

INTRODUCTION

- The concept of assisting driver in the task of longitudinal vehicle control is known as cruise control.
- The idea of driver assistance was started with the 'cruise control devices' first appeared in 1970's in USA.
- Starting from the cruise control devices of the seventies and eighties, now the technology has reached cooperative adaptive cruise control.

Why Adaptive Cruise Control

- Everyday the media brings us the horrible news on road accidents. Once a report said that the damaged property and other costs may equal 3 % of the world's gross domestic product.

- The death on the street account for more that 17% of total death around the world.

Cont…

- The conventional cruise control was capable only to maintain a set speed by accelerating or decelerating the vehicle.
- Adaptive cruise control devices are capable of assisting the driver to keep a safe distance from the preceding vehicle by controlling the engine throttle and brake according to the sensor data about the vehicle.

ADAPTIVE CRUISE CONTROL (ACC)

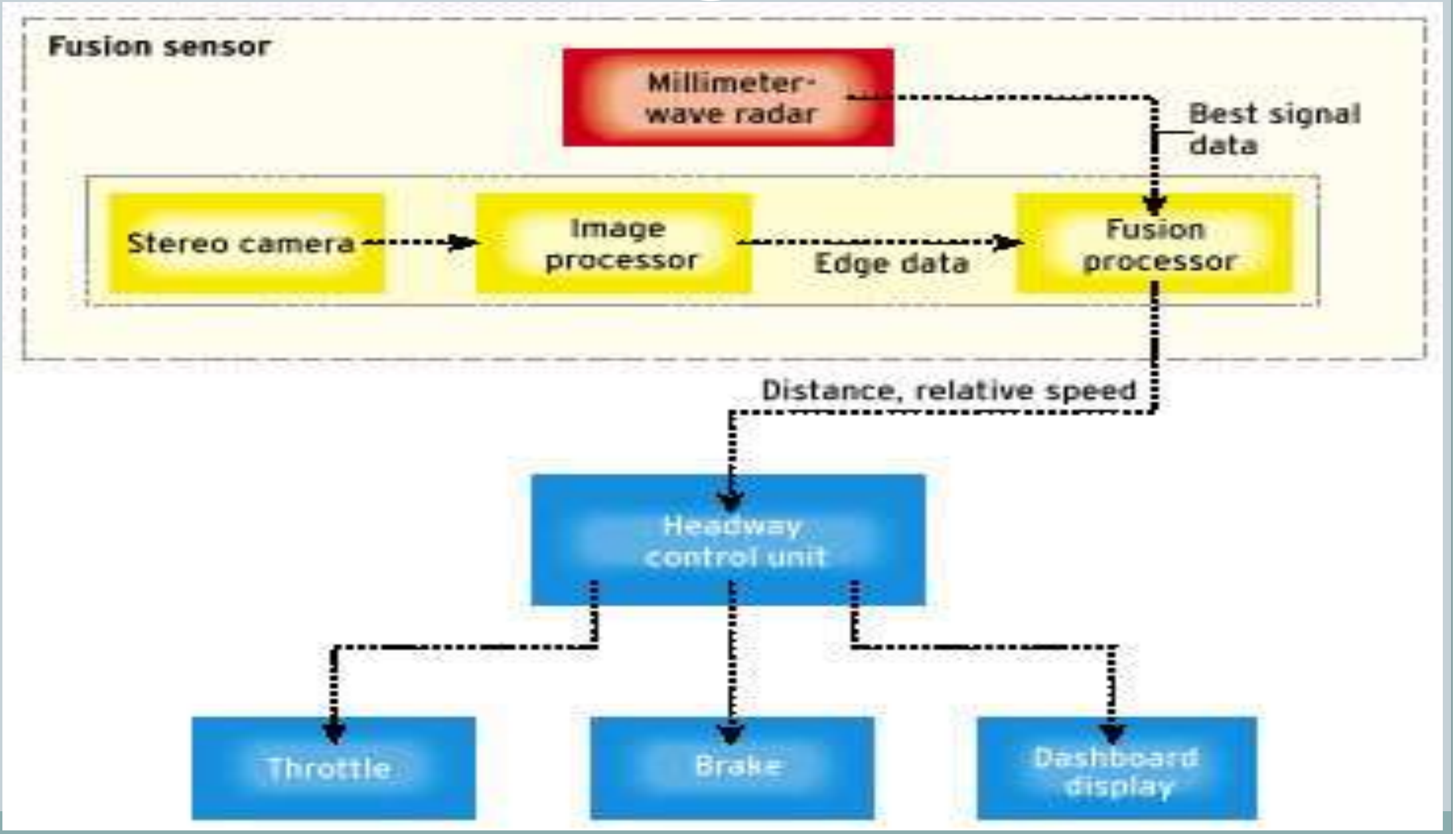
- **CONSTITUENTS OF AN ACC SYSTEM:**

1. A sensor (LIDAR or RADAR) usually kept behind the grill of the vehicle to obtain the information regarding the vehicle ahead. The relevant target data may be velocity, distance, angular position and lateral acceleration.
2. Longitudinal controller which receives the sensor data and process it to generate the commands to the actuators of brakes throttle or gear box using Control Area Network (CAN) of the vehicle.

SENSOR OPTIONS

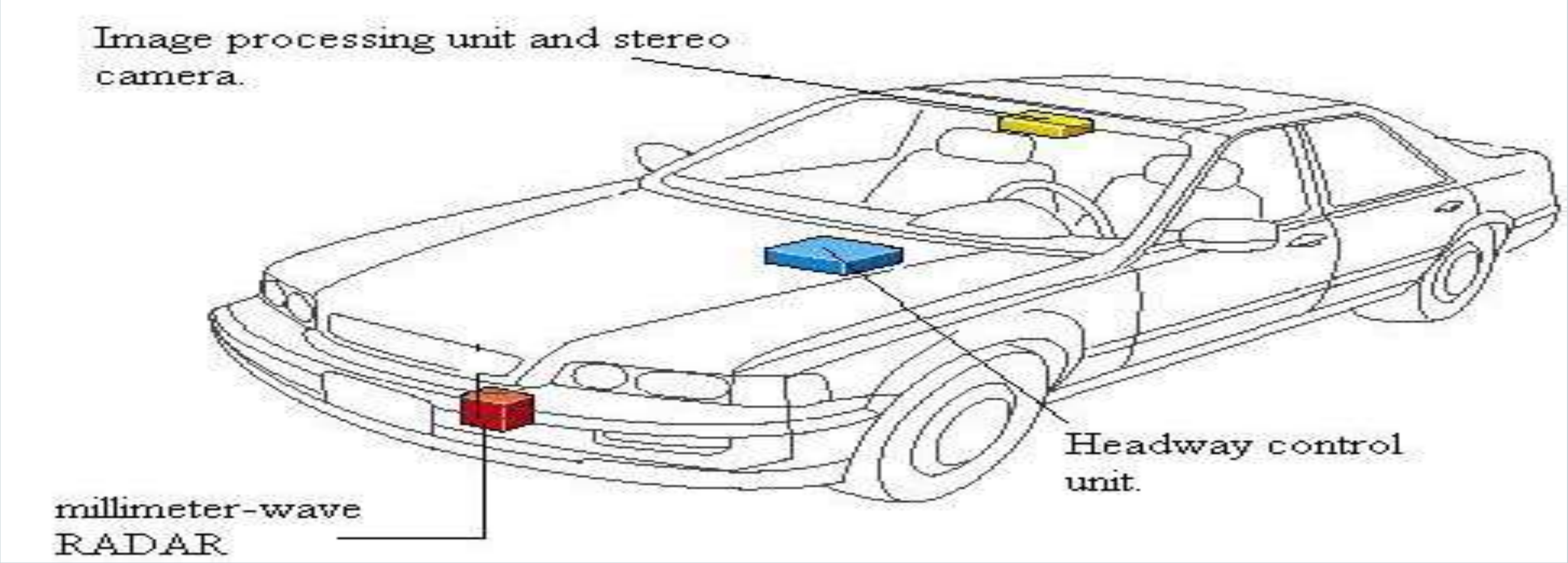
- 1. RADAR
- 2. LIDAR
- 3. VISION SENSORS
- 4. ULTRASONIC SENSOR

SENSING AND CONTROLLING PROCESS

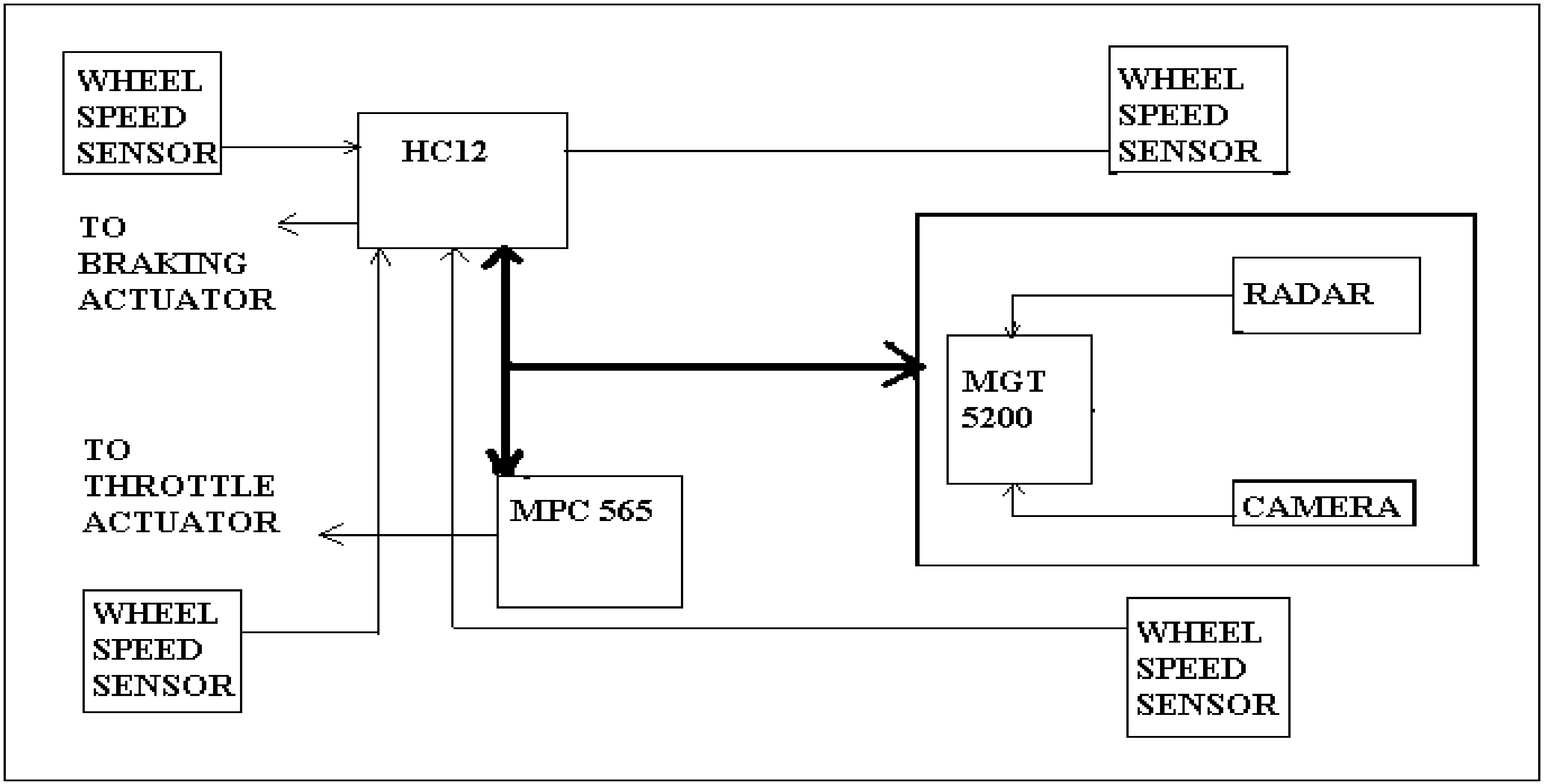


FUSION SENSOR

- The new sensor system introduced by Fujitsu Ten Ltd. and Honda through their PATH program includes millimetre wave radar linked to a 640x480 pixel stereo camera with a 40 degree viewing angle.



EXAMPLE OF ACC (MOTROLA ACC)



CONT…

- The Motorola ACC constitutes a DSP module having MGT5200 which provides a multiply-accumulator.
- The sensor data such as Radar information, that from camera and an IR sensor are processed in it, to generate the input data for the controller modules like HC12 and MPC565.

CO OPERATIVE ADAPTIVE CRUISE CONTROL [CACC]

- CACC system allows the vehicles to communicate and to work together to avoid collision.
- PATH–a program of California Department of Transportation and University of California with companies like Honda conducted an experiment in which three test vehicles used a communication protocol in which the lead car can broadcast information about its speed, acceleration ,breaking capacity to the rest of the groups in every 20ms.

MAIN POSTULATIONS ABOUT CACC

- In CACC mode, the preceding vehicles can communicate actively with the following vehicles so that their speed can be coordinated with each other.
- Because communication is quicker, more reliable and responsive compared to autonomous sensing as in ACC.
- Because braking rates, breaking capacity and other important information about the vehicles can be exchanged, safer and closer vehicle traffic is possible.

ADVANTAGES

- The driver is relieved from the task of careful acceleration, deceleration and braking in congested traffics.
- A highly responsive traffic system that adjusts itself to avoid accidents can be developed.
- Since the breaking and acceleration are done in a systematic way, the fuel efficiency of the vehicle is increased.

DISADVANTAGES

- A cheap version is not yet realized.
- A high market penetration is required if a society of intelligent vehicles is to be formed.
- Encourages the driver to become careless. It can lead to severe accidents if the system is malfunctioning.

CONCLUSION

The accidents caused by automobiles are injuring lakhs of people every year. The safety measures starting from air bags and seat belts have now reached to ACC and CACC systems. The researchers of Intelligent Vehicles Initiative in USA and many other country are working on technologies that may ultimately lead to vehicles that are wrapped in a cocoon of sensors with a 360 –degree view of their surroundings..

THANK YOU