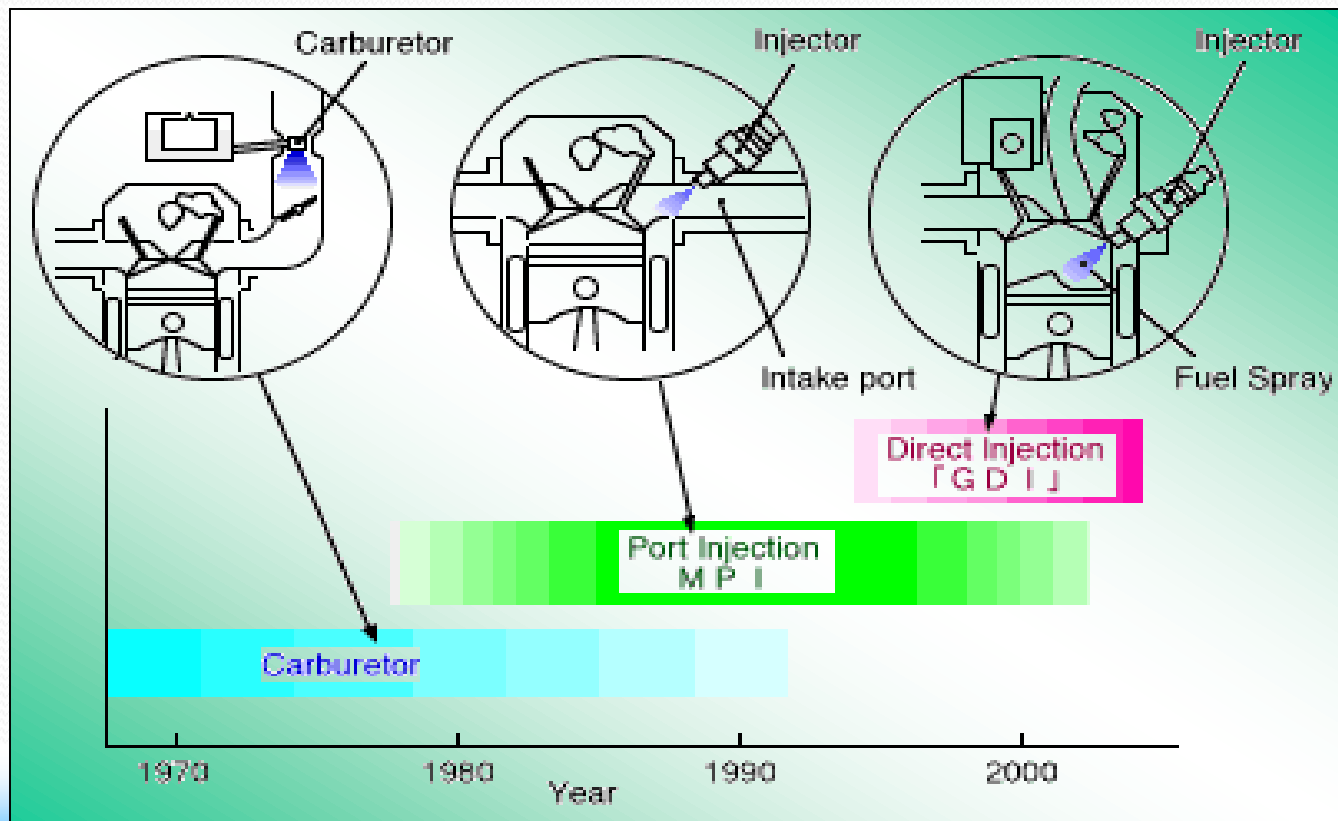


# LECTURE-11

## FUEL INJECTION IN SI ENGINE

# INTRODUCTION

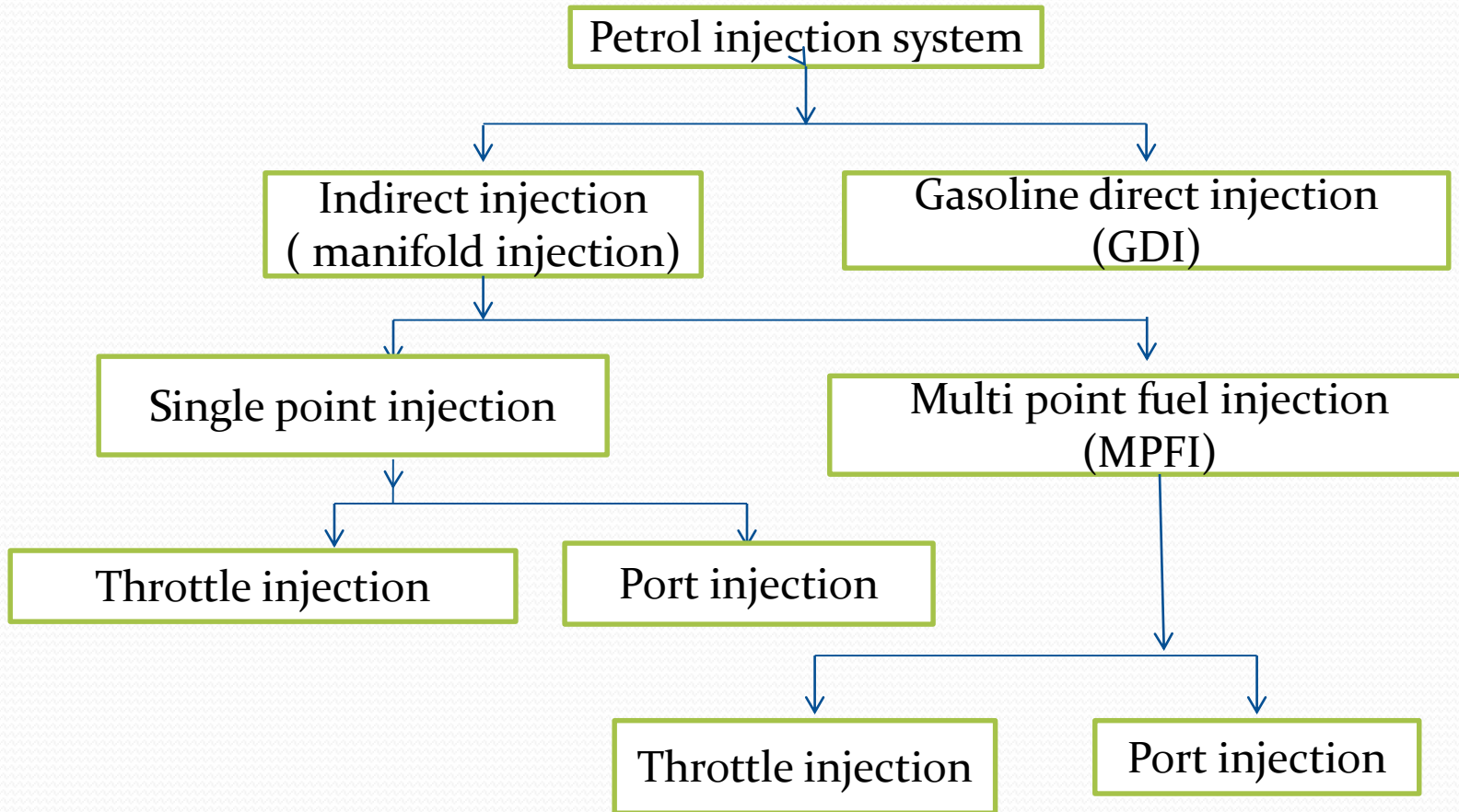
## Transition of Fuel Supply System



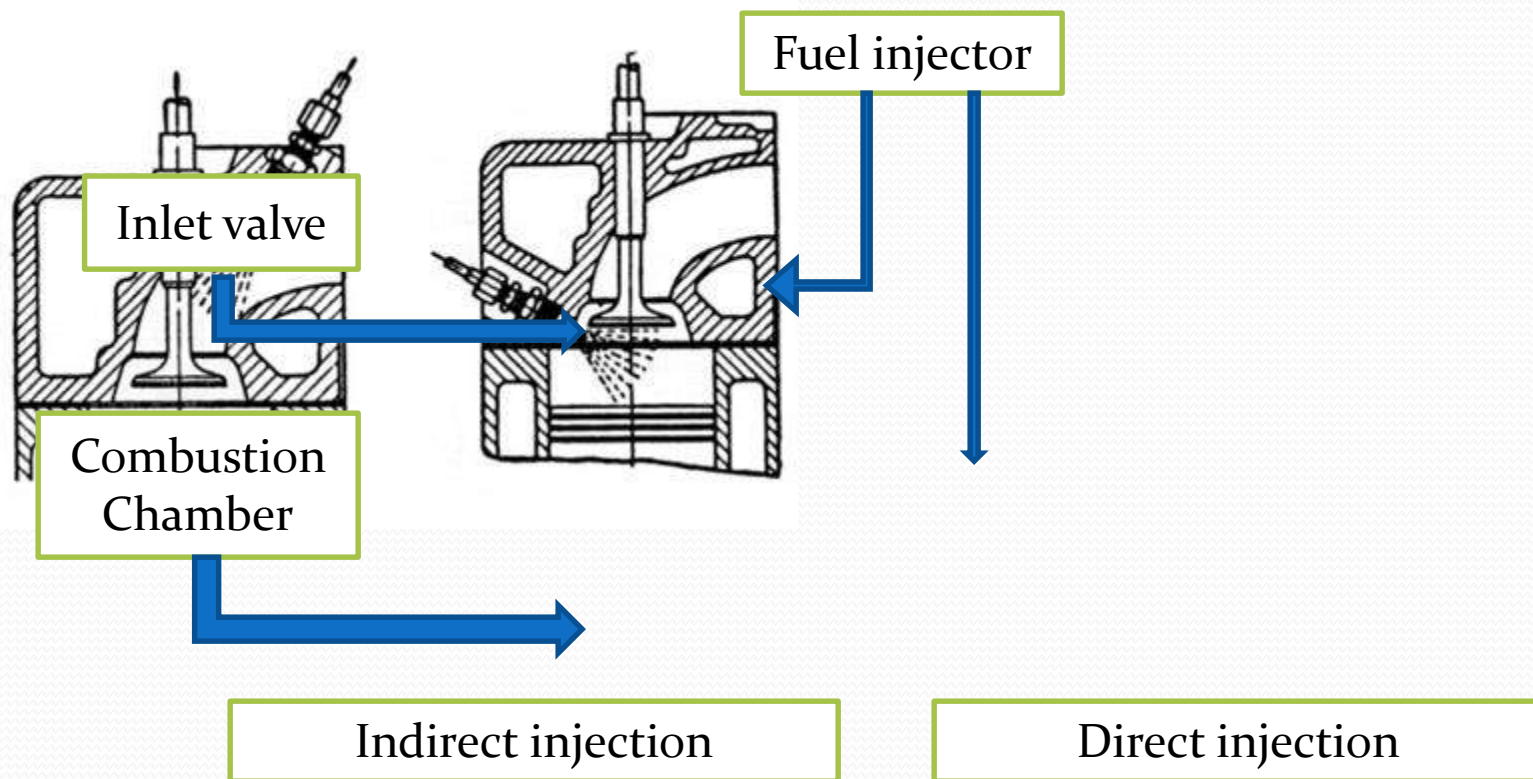
## ADVANTAGES OF FUEL INJECTION OVER CARBURETOR

- ☀ Fuel injection has no choke, but sprays atomized fuel directly into the engine.
- ☀ Electronic fuel injection also integrates more easily with computerized engine control systems.
- ☀ Multi port fuel injection delivers a more evenly distributed mixture of air and fuel to each of the engine's cylinders.
- ☀ Sequential fuel injection improves power and reduces emissions.

# TYPES OF PETROL INJECTION SYSTEM



- In indirect fuel is injected into the air stream before entering the combustion chamber.
- And in direct injection system fuel is injected directly inside the combustion chamber.

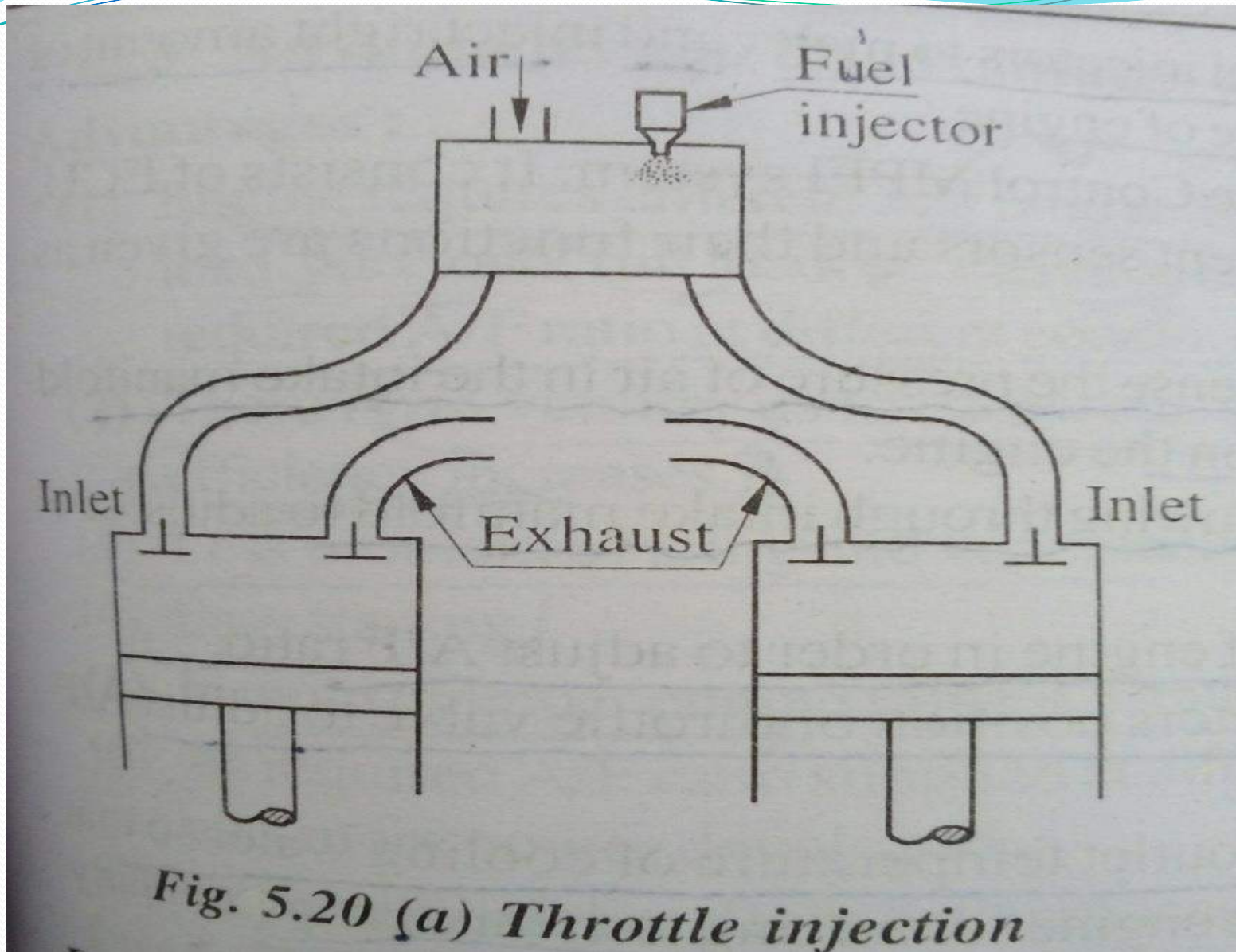


# ➤ Single Point Injection system

- The earliest & simplest type of fuel injection, single point simply replaces the carburetor with one or two fuel injector nozzles in the throttle body, which is the throat of the engine's air intake manifold.
- Single point injection system meters fuel better than a carburetor and is less expensive and easier to service.

# ➤ Throttle Injection

- The indirect injection can be classified as single point injection and multi point fuel injection.
- The single point injection also called **Throttle injection** in which fuel is injected at one place in throttle body, and the mixture supply to different cylinders as shown in fig...

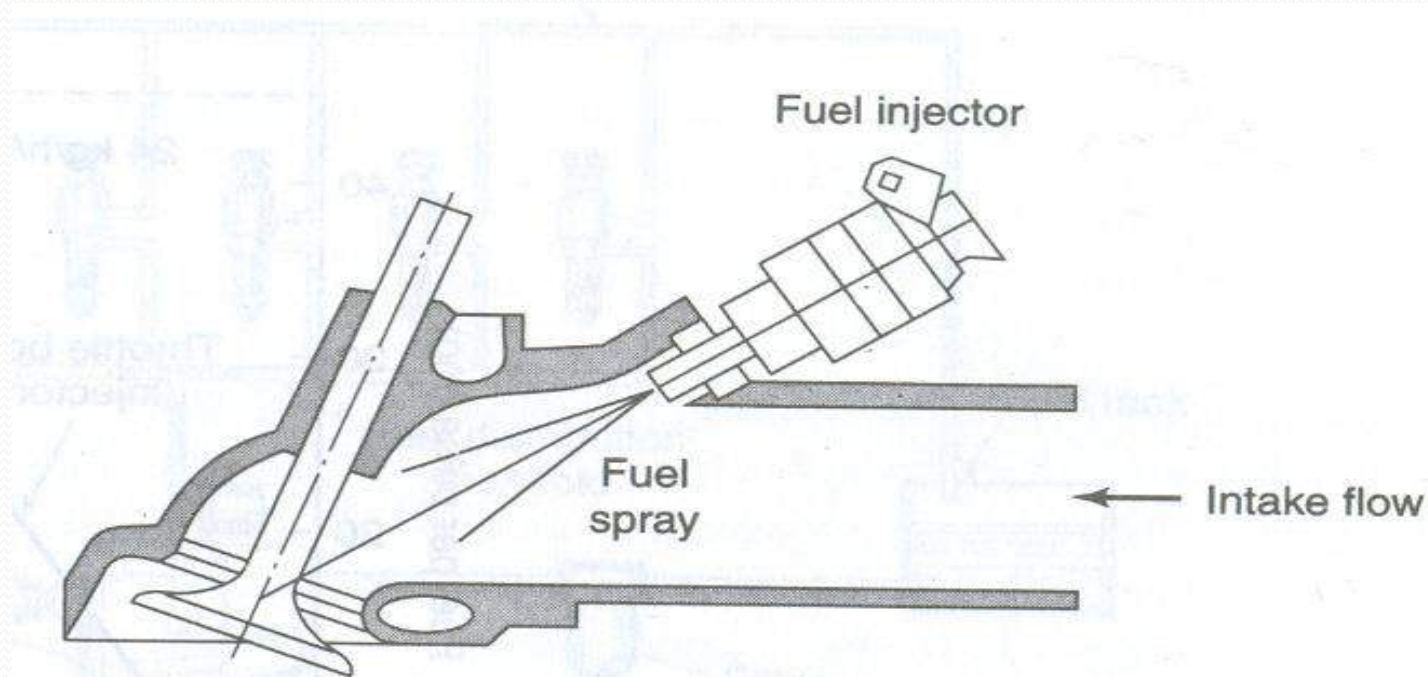


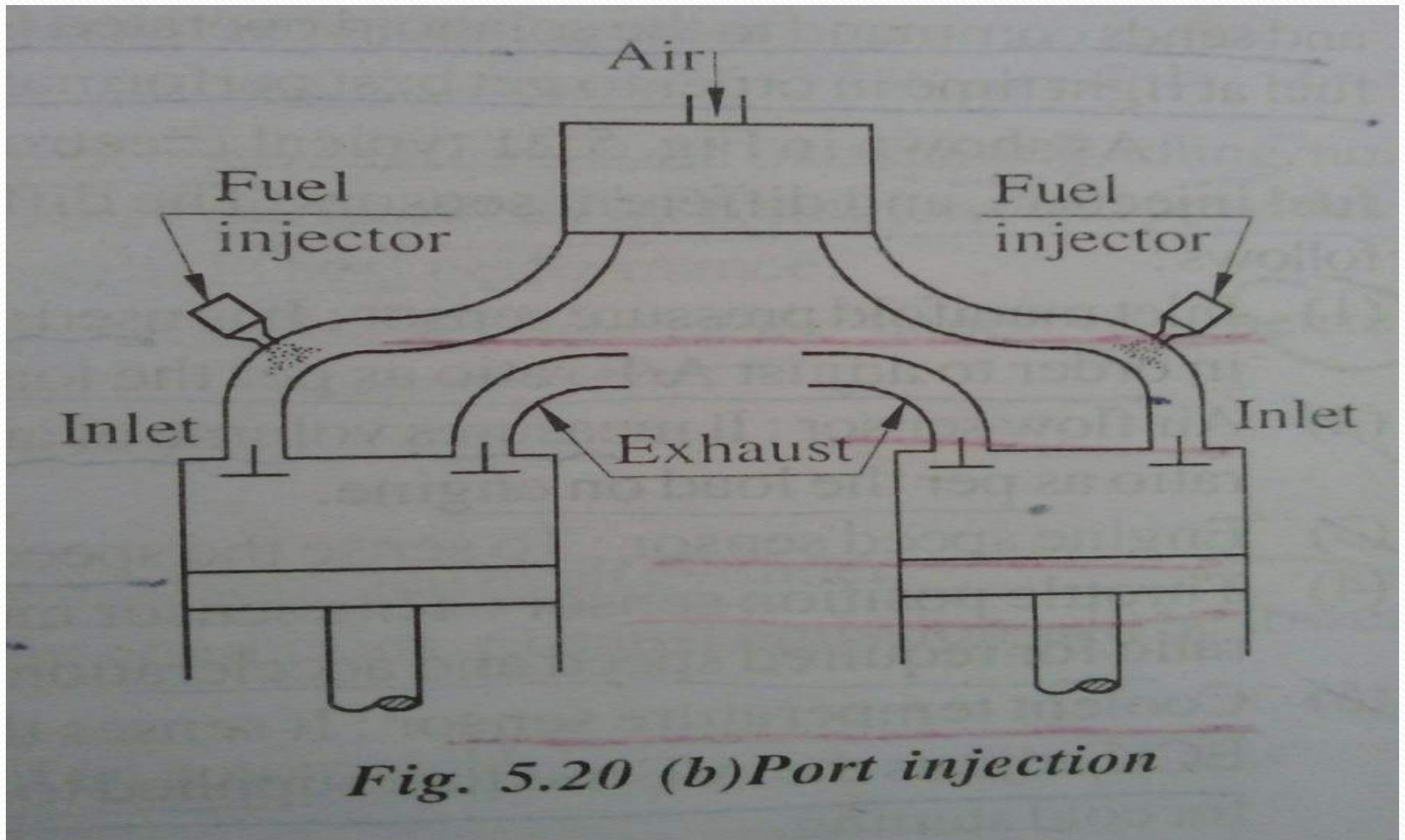
*Fig. 5.20 (a) Throttle injection*



## ➤ Port injection

- In case of **Port injection** also called multi point fuel injection, air sucks through throttle body, and fuel is injected near inlet valve of every cylinder as shown in fig....





*Fig. 5.20 (b) Port injection*

# ➤ Multi Point Fuel Injection System

## (MPFI)

- MPFI system is widely used in petrol engine in place of carburetor.
- Purpose of MPFI is supply proper A/F ratio to each cylinder of engine.
- Fuel tank > Pump > High pressure petrol > Distributor > Fuel injector > Cylinder
- Now a days MPFI system control by Electric Control Module (ECM).
- Ecm receives signal from different sensors.
- ECM receives signal and send to the solanoid operated fuel injector to meter and inject right amount of fuel at right time.



➤ There are different type of sensors in MPFI system.

1. Inlet manifold pressure sensor
2. Air flow sensor
3. Engine speed sensor
4. Throttle position sensor
5. Coolant temperature sensor
6. Inlet air temperature sensor
7. Knock sensor
8. Exhaust gas sensor

## ➤ Direct injection (GDI)

- These systems inject the fuel directly into the combustion chamber, either during the intake stroke or during the compression stroke.
- There are two basic type of GDI, either injection of gasoline alone, or a duel injection of gasoline and air together.
- Injection of fuel alone is usually done during the compression stroke and is somewhat similar to fuel injection in CI engine. Because of the very short time available for vaporization and mixing with air, very fine droplets of fuel are required, as are high turbulence and bulk mass motion within the combustion chamber

- Injector pressure must be higher than that required for port injection.
- This is because of the higher pressure into which the fuel is being injected, and because of the requirement for finer droplets of fuel.
- Pressure required for fuel injection is above 40 to 65 bar.
- Modern gasoline engine may utilize Direct injection using electric control.

# Fuel injection in two wheelers

1. It uses advanced sensors and actuators to calculate and deliver the optimum amount of fuel to the engine – enhancing both performance and mileage.
2. more responsive leading to quick initial pickup and delivering smooth passing acceleration.
3. It achieves a 14% improvement\* in fuel economy.
4. its intake/exhaust valve layout is designed to best match the hemispherical combustion chamber. In combination with the optimized intake and exhaust port shapes, this design increases combustion speed and helps achieve excellent combustion efficiency. The new engine further improves fuel efficiency and the feeling of acceleration while retaining the excellent performance qualities of the current FZ engine.



# ➤ Advantages of Direct Injection

- Better vaporization
- Higher volumetric efficiency
- Easy cold starting
- Lower exhaust emission
- Higher efficiency and better mileage