

UNIT-VIII

Sources of Atmospheric Pollution from the automobile

POLLUTANTS

2.65.1. Pollution Derived from Combustion Products

Pollutants are produced by the *incomplete burning* of the air-fuel mixture in the combustion chamber. The *major pollutants* emitted from the exhaust due to *incomplete combustion* are :

1. Carbon monoxide (CO)
2. Hydrocarbons (HC)
3. Oxides of nitrogen (NO_x).

Other products produced are *acetylene, aldehydes* etc. If, however, combustion is complete the only products being expelled from the exhaust would be *water vapour* which is harmless, and *carbon dioxide*, which is an inert gas and, as such it is not directly harmful to humans.

1. Carbon monoxide (CO) :

- It is a *colourless gas* of about the same density as air.
- It is a *poisonous gas* which, when inhaled, replaces the oxygen in the blood stream so that the body's metabolism can not function correctly.
- Small amounts of CO concentrations, when breathed in, slow down physical and mental activity and produces headaches, while large concentration will kill.

Mechanism of formation of CO :

CO is generally formed when the mixture is rich in fuel. The amount of CO formed increases as the mixture becomes more and more rich in fuel. A small amount of CO will come out of the exhaust even when the mixture is slightly lean in fuel. This is due to the fact that equilibrium is not established when the products pass to the exhaust. At the high temperature developed during the combustion, the products formed are unstable, and the following reactions take place before the equilibrium is established.

2. Hydrocarbons (HC) :

- Hydrocarbons, derived from unburnt fuel emitted by exhausts, engine crankcase fumes and vapour escaping from the carburettor are also harmful to health.

Mechanism of formation of HC :

- Due to existence of local very rich mixture pockets at much lower temperatures than the combustion chambers, unburnt hydrocarbons may appear in the exhaust.
- The hydrocarbons also appear due to flame quenching near the metallic walls.

A significant portion of this unburnt hydrocarbon may burn during expansion and exhaust strokes if the oxygen concentration and exhaust temperature is suitable for complete oxidation. Otherwise a large amount of hydrocarbon will go out with the exhaust gases.

3. Oxides of nitrogen (NO_x) :

- Oxides of nitrogen and other obnoxious substances are produced in very small quantities and, in certain environments, can cause pollution ; while *prolonged exposure is dangerous to health.*