Prevention and Control of Air Pollution

CHAPTER-8

PREVENTION AND CONTROL OF AIR POLLUTION

Prevention of air pollution is not so simple and practical to achieve at reasonable cost. All the growing needs and amenities of modern life are causing some air pollution. Example - it is difficult to drive a car or scooter without causing some air pollution. Similarly it is difficult to run an industry without causing air pollution.

Sustainable Mitigation Strategy

Any approach should be made in a way, which will not affect our developing economy. However, simultaneously a policy should be strictly followed in order to protect the environment from automobile emissions. Progressive strategy includes first alternative arrangement then the policy should be forcibly imposed to save the deteriorating environment. The economist and environmentalist should find out mutually beneficial solutions to overcome and develop the economic status. The goal of sustainable mitigation strategy will be of balancing both the economy as well as the environment. These approaches are generally termed as green economics, green technology and green planning etc. Goals can be achieved in the following ways:
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1. Natural ways
2. Vehicle ways
3. Transport management and policy
4. Moral and Education awareness

1. Natural ways

The deleterious effects of air pollutants on plants have long been recognized. Several studies here revealed that certain plants can absorb the gaseous pollutants from atmosphere directly. The rate of removal of gaseous pollutant were in the following order; Hydrogen fluoride (HF), Sulphur dioxide (SO$_2$), nitrogen dioxide (NO$_2$), Ozone (O$_3$), Peroxyacetyl nitrate (PAN), Nitric oxide (NO) and Carbon monoxide (CO) (Hill, 1971). Vegetation could therefore be an important sink for the pollutants (Garland et al, 1973; Siebke et al, 1990). Since plants act as scavenger of several pollutants, this property of plants can be judiciously utilized in reducing emissions from the environment. Recent studies pertaining to the role of plants in monitoring and mitigating air pollution have shown that certain plants can be used to reduce the emissions in the Allahabad city. However, it seems to be the long way to achieve goal but indeed is a novel approach, besides being economically acceptable and affordable control technology. Singh et al has studied such plants in the Allahabad city, which can be used to reduce the air pollutants. The following plants have been studied specifically and were found to possess extraordinary capability of reducing auto emission. Ailanthus excelsa Roxb., Antigoron Leptopus
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Green belt should be designed and developed in and around Allahabad city. The scavenger properties of plant must be exploited in making green Allahabad. This way will be economically and environmentally acceptable for Allahabad in order to become sustainable city in future.

2. Vehicle Ways

(a) Hardware technology based improvements.

(i) Emission factor for vehicle registration:

Registration of vehicle is based on the emission standards. Only those vehicles should be allowed to register which fulfill the emission standard criteria. The old and poorly maintained vehicles should be phased out from city gradually.

(ii) Clean technology

Clean technology (catalytic converter, unleaded petrol, evaporative emission control system, exhaust gas recalculating system and ignition timing etc.) based vehicles’, high occupancy vehicles (HOV) should only be allowed on the road in the future. Catalytic
converter and other filters should be made compulsory for new vehicles as well as old.

(iii) **Vehicle maintenance**

Vehicles should be maintained according to the manufacturer’s recommendations (e.g. Tune ups, replacement of spark plug, carburetor adjustment etc).

(iv) **Inspection, maintenance and ant tampering checks**

An effective programme of inspection, maintenance and ant tampering should be regularized so that the vehicles are replaced/repai red if tampered for better mileage. The owner should be benefited by incentives or charged penalties according to vehicle’s condition.

(b) **Fuel ways improvements**

Energy supply options that increase the efficiency of producing energy carriers primary emissions of green house gases can contribute to sustainable development objectives.

(i) **Compressed natural gas (CNG)**

Natural gas has lowest emission rate of all fossil fuel and can in general, be used more efficiently than the fuel supplied.

(ii) **Electric driven vehicle for transport:**

Electric driven vehicles have great potential for dramatic reduction of air pollutant emissions and marked improvement in fuel economy.
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(iii) Ethanol

Ethanol is also known as grain alcohol. It is widely used in America and Brazil. The only drawback with ethanol is its high cost of production. Efforts are now being made to minimize its production cost through advanced enzymatic techniques. It is manufactured by fermentation of carbohydrates.

(iv) Reformulated Gasoline

It is better than other fuels and can efficiently be used in vehicles. Its advantages over other fuels are reduced emission of gaseous pollutants, fewer evaporative emissions during storage and refueling, less engine maintenance and enough energy density. It could be used by cars of all ages, without any modification.

(v) Solar-Powered Bicycle-No Pedaling

Very lately (October 1994) solar-powered bicycle was on show at the recent Hanover fair. This solar powered cycle needs no pedaling as its crossbar is fitted with a small power station. Charging of power station can last for one hour. A German named Varta has manufactured this bicycle.

(vi) Pollution free batteries

Recently, car manufacturers in the US have devised a battery, which they think will propel a new generation of pollution free vehicles. The new nickel metal hydride batteries use one electrode of nickel hydroxide and another electrode composed of nickel, vanadium, titanium and zirconium alloys. These alloys are capable of soaking up and storing the ionized hydrogen, which carries electrical charge. Test conducted by
US government’s Argons National Laboratory in Illinois have revealed the Ovonic’s battery delivered 250 Watts per kilogram of battery weight when fully charged, and twice that generated by a conventional lead acid battery of equal size. One of the main drawbacks of the battery is that it tends to give out quickly. Several other batteries, such as batteries that use chemical reactions involving lithium and sulphides or sodium and sulphur etc., are also being manufactured for pollution free vehicles. For example, Swedish Company ASEA Brown Boveri and Britain’s Chloride Silent Power are developing Sodium-Sulphur batteries for the same purpose.

(vii). Non polluting vehicle

According to a recent report (May 1994) a novel zinc-air battery will soon replace the petrol and diesel as fuel. The new battery, developed at a Jerusalem based Electric Fuel Limited Company, can store large amount of energy. The battery can be recharged by simply replacing electrodes. It is five times better than the nickel-cadmium battery and ten times efficient than the lead-acid battery. It can accelerate a vehicle from stand still to 80 Kmph in 12 seconds and can reach a maximum speed of 120 Kinph.

(viii) Clean fuel for transportation

Alternative transportation fuels are important now e.g. hydrogen offers good prospects for simultaneously dealing with the multiple challenges facing energy system in 21st century. Hydrogen is a clean versatile and easy to use energy carrier. It can also be derived from fossil fuel. Hydrogen used in fuel cell vehicles would emit significantly
lower life cycle CO₂ emission than gasoline internal vehicle combustion.

(ix) Mix fuel technology

Mix fuel technology should be adapted in the automobile system to achieve the same or similar transport services.

(x) Improving automobile fuel:

The quality of fuel used in India is one of the worst in the world. It is therefore, essential to upgrade the quality of fuel though a reduction of sulphur, tetraethyl lead and aromatics and an increase in the octane number. The unleaded petrol should be encouraged. Hydrosulphurisation units for reduction of the sulphur contents and catalytic reformer units for lead free petrol are required to be installed in the refineries. An increase in the octane number by 3 to 5 units will result in fuel economy and improvement in vehicular exhaust quality. This is possible through reduction of aromatics in the refining process. Lowering of aromatics will also help in reducing emission on volatile organic compounds (VOC) during combustion. The CPCB had recommended the following specifications for diesel and petrol (Table 65).
Table 65: Specification recommended by CPCB for diesel and petrol.

<table>
<thead>
<tr>
<th>Type of fuel</th>
<th>Content</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diesel</td>
<td>Sulphur</td>
<td>0.5%</td>
</tr>
<tr>
<td></td>
<td>Octane number</td>
<td>45</td>
</tr>
<tr>
<td>Petrol</td>
<td>TEL</td>
<td>0.15 gm/l</td>
</tr>
<tr>
<td></td>
<td>Sulphur</td>
<td>0.15%</td>
</tr>
<tr>
<td></td>
<td>Aromatics</td>
<td>25% by volume (maximum)</td>
</tr>
<tr>
<td></td>
<td>Benzene</td>
<td>11% by volume (maximum)</td>
</tr>
</tbody>
</table>

(3) Transport Management and Policy

Emission can also be checked by effective traffic management and implementing clean air policies.

(i) Smooth flow of traffic:

Smooth flow of traffic is only possible when road quality is improved. The potholes, speed breakers, encroachments, and narrow roads contribute a great deal to pollution and higher consumption of fuel.

(ii) Engine Stop:

Engine should be switched off if the stop is for more than two minutes particularly at traffic junction or crossings. This will save fuel and reduce the emission.
(iii) Educational programme

Educational and awareness programmes should be organized to educate and train the drivers and owners about traffic system.

(iv) Transport infrastructure

Transport infrastructure should be improved. Pressure of road traffic can be reduced by diverting alternative transport system viz. (a) local trains (b) water based transport system (c) Tonga/horse cart. (a) Local trains can be started in the city with the existing facilities of railway tracks and infrastructure. The Exhibit shows the proposed network of railway track in the city. (b) Water based transport can effectively reduce the load of automobiles on the road. This can be achieved by introducing small jet boats and small steamers in the Yamuna River and Ganga River. These suggested alternatives could reduce the vehicular frequency on the road and may effectively control the diluting environment of Allahabad city.

(4) Moral and Educational Ways

i) The single passenger commuters should be discouraged by introducing parking fees and providing facilities to bicycle commuters. The public pooled transport system should be encouraged, this will reduce the emission to certain extent. ii) The school boys and girls be discouraged for coming to school by two wheelers or car but simultaneously encouraged for using bicycles.
iii) Environmental awareness programmes should be prepared on how to save environment and energy by involving occupants, NGO’s residents, intellectuals, scientists, economists and medical supervisor.

iv) Environmental tax should be imposed on polluting bodies. This will generate the funds, which can be utilized strictly in getting new technology to researcher and Non-Governmental Organisation (NGOs) etc.

It can be possible to reduce the emission by using high quality energy carriers and by cost effective and use devices. It would also be possible to improve the living conditions with significant increase in per capita energy consumption from the present level.