ME8792-POWER PLANT ENGINEERING
UNITV-ENERGY,ECONOMICANDENVIRONMENTALISSUESOFPOWERPLANTS

5.3-POLLUTION CONTROL TECHNOLOGIES OF THERMAL

SELECTIONOFSITEFORTHERMALPOWERPLANT

1. Land Availability. Power plant needs a wide range of land requirements. For example,coal plants tend to need larger areas to support rail lines, coal piles, and landfills. Natural gas-fired power plants may only need area for the generation facilities and support equipment.Neededinformationincludesthe site size (acres),andthe portionof the site (acres) thatwouldbeoccupied byplant buildingsand systems.

2. WaterAvailability. Manypowerplanttechnologiesusewaterfromlakes,rivers,municipalwaterutilities,orgroundwater.Surfacewaterisusedforplantcoolingandgroundwater isusedforplantprocesses.Generally,thepresenceofadequateandusablewater resources at or near a site is preferred over sites with remote, inadequate, or low-quality waterresources.

3. Fuel Availability. Fuel availability influences choices positively; its marginal utility isdiminishing with supply. Without a higher level of availability, alternative fuels are unlikelytobeadopted.

4. SkilledManpower.AvailabilityApowerplantrequireslaborforconstructionandoperation. Local communities can benefit from these employment opportunities. Generally,sites that can make use of local labor are more desirable. These sites would have a largerskilledwork forcewithinashort distancefromtheplant site.

5. Land Acquisition Cost. Each site will have unique land acquisition requirements andeffects. Generally, sites that have lower land acquisition costs and require shorter acquisitiontimesaremoredesirable.

6. Future Development Limitations. The construction of a plant at a particular site

maycreate limitations on future development in the local area through its effect on land use orthrough its consumption of local PSD air increments, water resources, or water dischargecapacity. Generally, sites that impose fewer limitations on future development may be moredesirable.

7. Possibility of Site Expansion. A site might be able to support more generating capacitythanproposed.It'susuallymoreeconomicalandenvironmentallyacceptabletoaddgenerating capacity at an existing site than to build at a new site.. Often, an expandable sitemay be more desirable. But, a potential concern of local property owners is the effect of plantsiting on nearby property values. Generally, sites that enhance property values or minimizethedecreasein propertyvaluesmaybemoredesirable.

WASTEDISPOSALOPTIONSFORTHERMALPOWERPLANT

The disposal of the increasing amounts of solid waste from coal-fired thermal power plants is becoming a serious concern to the environmentalists. Coal ash, 80% of which is very fine in nature and is thus known as fly ash is collected by electrostatic precipitators in stacks. A 400 *MW* thermal power plant emits 500 *tons* of fly ash per day and the ash content of coal in India varies from 3 to 42%. In India, nearly 85 million tonnes per year of flyash is generated per annum at present and is largely responsible for environmental pollution. Although the scope for use of ash in concrete, brick making, soil-stabilization treatment and other applications has been well recognized, only a small quantity of the total ash produced in India is currently utilized in such applications. Most of the ash generated from the power plants is disposed off in the vicinity of the plant as a waste material covering several hectares of valuable land. The bulk utilization of ash is possible in two areas, namely, ash dyke construction and filling of low-lying areas.

(i) Flyash disposal in ash ponds:

Primarily, the flyash is disposed off using either dry or wet disposal scheme. In *dry disposal*, the flyash is transported by truck, chute or conveyor at the site and disposed off by constructing a dry embankment (dyke). In *wet disposal*, the flyash is transported as slurry through pipe and disposed off in impoundment called "ash pond". Most of the power plants in India use wet disposal system, and when the lagoons are full, four basic options are available:

(a) Constructing new lagoons using conventional constructional material,

(b) Hauling of flyash from the existing lagoons to another disposal site,

(c) Raising the existing dyke using conventional constructional material, and

(d) Raising the dyke using flyash excavated from the lagoon ("ash dyke").

The option of raising the existing dyke is very cost effective because any fly ash used for constructing dyke would, in addition to saving the earth filling cost, enhance disposal

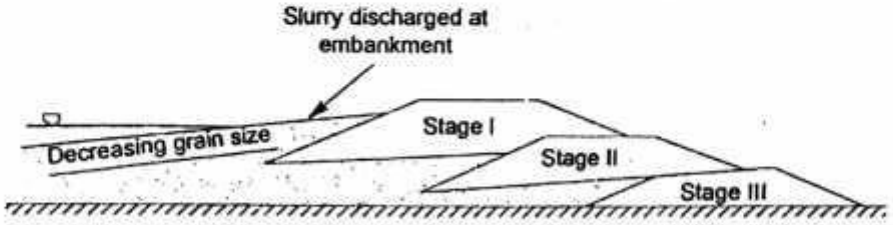
capacity of the lagoon. The constructional methods for an ash dyke can be grouped into three broad categories:

(a) Upstream method,

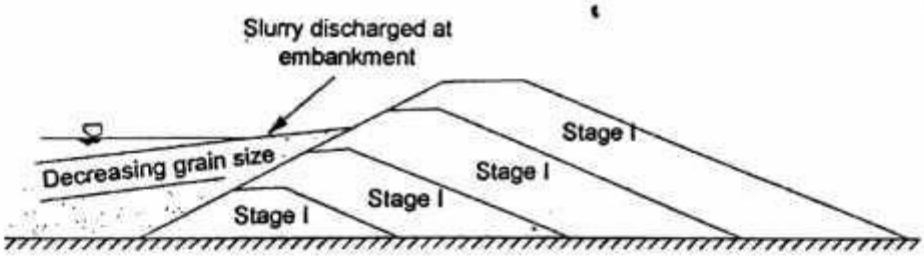
(b) Downstream method and

(c) Centerline method.

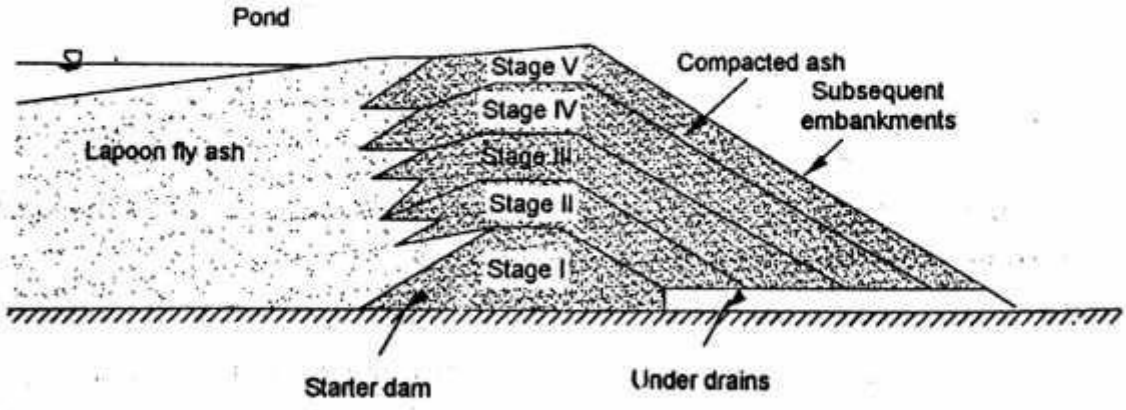
Figure shows typical configurations of embankments constructed using the different methods. The construction procedure of an ash dyke includes surface treatment of lagoon ash, spreading and compaction, benching and soil cover.



(a) Upstream Method



(b) Downstream Method



(c) Centreline Method

Typical ash dyke raising configurations

According to the hazardous waste management and handling rule of 1989, flyash is considered as non-hazardous. With the present practice of fly-ash disposal in ash ponds (generally in the form of slurry), the total land required for ash disposal would be about 82,200 hectare by the year 2020 at an estimated 0.6 hectare per MW. Flyash can be treated as a by-product rather than waste.

(ii) Treatment of wastewater of steam power plant:

If the waste water from the power plant is not properly handled, it will pollute the water basin. Various types of waste water collected from the steam power plant are given below.

(i) Waste water from water treatment plants.

(ii) Water from hydraulic ash disposal system.

(iii) Rainwater collected on the territory of power plant.

(iv) Cooling waters used in power plants.

The waste water from water treatment plants contains various metal salts, acids and alkalis which may affect the water basin. It ensures the waste water of hydraulic ash disposal system not having any contaminations before it goes to the water basin. The cooling water of plant carries an enormous amount of heat. This heat will affect the water basin. So, the heat is to be reduced before it goes to the basin. The water purification is done by the following methods.

1. Filtering
2. Flotation
3. Centrifuging
4. Coagulation
5. Setting and clarifying
6. Bio-chemical methods.