# CHAPTER – 2

# PRODUCTION AND CONSUMPTION OF POND ASH IN INDIA

## SOURCES:

Pond ash is produced as a result of combination of coal; fly ash and bottom ash are mixed together with water to form slurry, which is pumped into the ash pond area. In ash pond area, ash gets settled and excess water is decanted. This deposited ash is called pond ash.

Among industries thermal power plants are major contributor of pond ash. Besides, this steel, copper and aluminium plants also contribute a substantial amount of pond ash. 230-250 million tons of coal is used every year by thermal power plants. Indian coal being mostly sub bituminous type, then bituminous and lignite type has ash content ranging from 35% to 50% which results in huge amount of pond ash as by-product.

## ESTIMATION OF POND ASH GENERATION IN INDIA

According to Central Electricity authority of India, there are around 83 major coal fired thermal power plants and 305 hydro power plants existing in India. In addition to this, there are more than 1800 selected industrial units which captive thermal power plants of greater than 1 MW. About 65-70% electricity generated in India is thermal. Fly ash generation in India is around 120 million tons per annum and is set to increase further with the forthcoming ambitious projects to meet the electrical requirements of the country. The NCR region alone accounts for about 2500 tons of pond ash per annum. 230- 250 million tons of coal is used every year by thermal power plants and Indian coal being mostly sub bituminous type, then bituminous and lignite type has ash content ranging from 35% to 50%. According to NTPC, coal is used for 62.3% electric power generation in India. We only utilize about 30% of this pond ash produced which has a great potential of being used profitably in an environment friendly manner for various purposes.

## ASH COLLECTION

Ash can be collected in following categories –

### Dry Fly Ash

Dry Ash is collected from different rows of electrostatic precipitators. It is available in two different grades of fineness in silos for use as resource material by different users.

### Bottom Ash

Bottom Ash is collected from the bottom of the boiler and transported to hydro bins and then ash mound for use in road embankment.

### Conditioned Fly Ash

Conditioned fly ash is also available in ash mound for use in land-fills and ash building products.

## UTILIZATION OF FLY ASH

Pond Ash has a great potential of being used as a bulk fill material. Many studies are available like that of Gray and Lin [29]; Digioia and Nuzzo [31]; Glogowski et al. [32], Kaniraj and Havanagi [27]; Kaniraj [26]; Seals et al. [28], determined the various engineering properties and also chemical composition of bottom ash samples. Leonards and Bailey [25] reported that the compacted pulverized coal ash, consisting of fly ash with varying percentages of bottom ash, had been used successfully as a structural fill material.

Pond Ash which can be used for soil improvements has gained tremendous impetus during the last two decades. Initial uses of pond ash, stabilized with lime, as a highway sub grade dates back to the late 1950s and early 1960s (Davidson & Handy 1960; Snyder and Nelson 1962). In 1970s the variety of fly ash applications increased (Copp & Spencer 1970 Joshi et al. 1975), and applications enveloping cement stabilized fly ash were introduced.

Selected pond ash is used for manufacture of building products like lime fly ash bricks/blocks replacing the otherwise used top soil. The use of natural top soil poses its own environmental problems. It's also being considered to being used in concretes in various amounts replacing natural sand. Fly Ash has a vast potential for use in High Volume Fly Ash concrete especially due to its physic-chemical properties. A major utilization of pond ash is seen today in structural fillings and embankment construction [29] for pavements. It also plays a significant role in reclamation of low lying areas where it has been used profitably and effectively. Very fine fly ash is also being used by cement industry to use it as a binder material. Further, Ministry of Environment and Forests has also issued directions for restricting the excavation of top soil for manufacture of bricks and promoting the utilization of fly ash in the manufacture of building materials and in construction activity within a specified radius of 100 km from coal based thermal power plants. In a regulation issued by Ministry of Environment and Forests (MoEF) in 1999, it was stipulated that all new coal thermal power plants should be able to use 100% of the fly ash they produce within the first nine years of operation. For existing plants, MoEF has set a time period of 15 years for 100% ash utilization from the date of issue of the regulation [16]. This is an ambitious regulation posed by MoEF which presses on the need to find and develop more potential utilities of pond ash by increased scientific investigation and research in this area.

A mission, namely, FLY ASH MISSION was initiated in 1994 to promote gainful and environment friendly utilization of the material. Central Road Research Institute

(CRRI), New Delhi, chosen as the 'nodal agency' for using fly ash as a bulk material for construction of roads and embankments. Some of these are jointly with Fly Ash Mission, today known as, Fly Ash Utilisation Programme (FAUP). An example set up by PWD – Delhi and CRRI in New Delhi is second Nizammudin Bridge which has demonstrated the suitability of the material for road / embankment construction. Also, Okhla Fly Over bridge, New Delhi and Hanuman Setu in Delhi, both by PWD – Delhi with the technical support and specifications from CRRI has further marked the potential of utilization of pond ash in construction of embankments.

**Pic. 2 – Construction of embankment with fly ash at second Nizamuddin Bridge in Delhi**

**Pic. 3 – Construction of embankment with fly ash at Kalindi Bypass in Delhi**

## ECONOMY IN USE OF FLY ASH:

Economy plays a vital role in decisively using a waste material for construction. Use of fly ash in road works results in reduction in construction cost by about 10 to 20 %.[22] Typically cost of borrow soil varies from about Rs 100 to 200 per cubic meter. Fly ash is available a free of cost or at a price of Rs 100 per ton at the power plant and hence only transportation cost, laying and rolling cost are effective in case of fly ash. Similarly, the use of fly ash in pavement construction results in significant savings due to savings in cost of road aggregates. If environmental degradation costs due to use of precious top soil and aggregates from borrow areas quarry sources and loss of fertile agricultural land due to ash deposition etc are considered the actual savings will be much higher and fly ash use is justified.

The use of fly ash results in an enormous amount of cost saving. Broad estimates reveal that in the second Nizamuddin approach project, about Rs.1 crore has been saved by avoiding expenditure on the use of soil and its transport.[22] It is estimated that there is a direct cost saving of around 30-40% in road embankments if fly ash is used instead of soil. In addition, DVB has saved about Rs.30 lakhs in transportation cost. Not to forget, the contribution to environment protection and agricultural produce is enormous, if compounded objectively.