iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 3 **Issue:** I **Month of publication:** January 2015

DOI:

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

ISSN: 2321-9653
International Journal for Research in Applied Science & Engineering Technology (IJRASET)

A Case Study: Problem Associated With Fly Ash Disposal

Ashish V Talati[1], Vaishakhi ATalati[2]
Civil Engineering, Dr. Jivraj Mehta Institute of Technology

Abstract: Coal based thermal power stations are presently the mainstay of power development and this is likely to be so in the immediate future also, considering the present status of the projects and various constraints in development of hydro and nuclear power. The aim is to study waste water treatment provided at coal based power station. There are several advantages as well as disadvantages for thermal power generation.
Keywords: Coal based power plant, Fly ash, ash disposal problem, ash dyke, effluent treatment plant.

I. INTRODUCTION TO POWER AND POLLUTION PRODUCTION IN INDIA

India is the world's fourth largest economy and has a fast growing energy market. India's current power capacity is 30% short of demand. Coal and petroleum are the primary sources of energy. With India being a country of chronic power deficits, the Government of India has planned to provide 'power for all' by the end of the eleventh plan (by 2012). This would entail the creation of an additional capacity of at least 100,000 MW by 2012. The Ultra Mega Power projects, each with a capacity of 4000 megawatts or above, are being developed with the aim of bridging this gap. Already some UMPP's are under implementation at Saasan-(Reliance Energy), Mundra-(TATA power), Kudagi-(NTPC) etc. Hitachi has recently developed products and services for advanced support for maintenance and preservation through the use of IT (information technology) and network technology, going beyond what has previously been available. This technological innovation needs to be adopted by the existing as well as forth coming power plants not only to increase the efficiency of power production but also to increase the life of the power plants.The per capita availability and consumption of electricity is very less in the country as compared to the developed world. The rapid economic growth and the resultant increased standard of living of the population calls for huge increase in supply of power. Beside this High ash content in Indian coal and inefficient combustion technologies contribute to India's emission of air particulate matter and other trace gases, including gases that are responsible for the greenhouse effect.India is the third-largest producer of coal, but Indian coal is of poor quality with high ash content (35-50%) and low calorific value (gross heat of combustion). A major portion of the ash is inherent in the coal, aggravating the difficulty in removing it.

II. ENVIRONMENT CONCERNS OF THERMAL POWER STATIONS

A. Air Pollution

Particulate matters, SO2, NOx and CO are emitted from the combustion of fuels in a thermal power plant. If released uncontrolled, these can affect humans, vegetation, buildings and monuments, aquatic & forest ecosystem. The emission of large quantities of SO2 and NOx from a TPP may result in Acid-rain problems.

B. Waste Water Discharge

The largest wastewater streams from a TPP are cooling water blow down, which can be either recycled or discharged. If discharged to a surface water body, then its chemical quality gets affected. Associated waste-heat can impact ambient water temperature which in turn can radically alter aquatic plant and animal communities. Other effluents from a TPP, like waste water from de-mineralized backwash and resin regenerator wastewater, ash transport water, and runoff from coal piles, ash piles and site, trace metals, acids and other chemicals in various combinations in the effluents, oil spills etc. have a negative impact on water quality.

C. Ash handling and disposal

Ash disposal can have adverse impacts on the environment due to land use diversion, resettlement, water resources allocation and air pollution. Construction of large ash disposal areas results in resettlement issues, loss of agriculture/grazing land/ habitat. When the ash gets dried in the absence of water or vegetation cover, fugitive dust from ash pond pollutes the air thereby increasing local concentration of respirable particulate. Once-through slurry disposal systems place additional strain on scarce

fresh water resources.

D. Land Degradation

The thermal power stations are generally located on the non-forest land and do not involve much Resettlement and Rehabilitation problems. However its effects due to stack emission etc, on flora and fauna, agricultural and other land have to be studied for any adverse effects. Large land requirement for ash disposal and hazardous elements percolation to ground water through ash disposal in ash ponds are the serious effects of thermal power stations.

E. Noise Pollution

Some areas inside the plant will have noisy equipment such as crushers, belt conveyors, fans, pumps, milling plant, compressors, boiler, turbine etc. Various measures to reduce the noise generation and exposure of workers to high noise levels in the plant area include silencers of fans, compressors, steam safety valves etc., using noise absorbent materials, providing noise barriers for various areas, noise proof control rooms. Provision of green belt around the plant will further reduce noise levels.

F. Problems associated of increasing fly ash

1) India has about 211 billion tons of coal reserves, which is known to be the largest resource of energy and presently 240MT of coal is being used annually to meet the Nation's electricity demand. In terms of energy, India stands at world sixth position accounting 3.5% of the world commercial energy demand in 2001, but the electricity generation yet not completely fulfilled the present requirement.
2) The coal available in India is of poor quality, with very high ash content and low calorific value, and most of the coal mines are located in the eastern part of the country. Whatever good quality coals available used by the metallurgical industry, like steel plants. The coal supplied to power plants is of the worst quality.
3) High ash content in Indian coal and inefficient combustion technologies contribute to India's emission of air particulate matter and other trace gases, including gases that are responsible for the greenhouse effect.
4) Fly ash water also affects the scale structure because it is a directly in contact with water. Heavy metals can also adversely affect the growth rate in major carps.

G. Environment Protection Guidelines for Ash disposal

THERMAL POWER PLANT: STANDARDS FOR LIQUID EFFLUENTS

Source	Parameter	Concentration not to exceed, mg/l (except for pH & Temp.)
Condenser Cooling Water (once through higher cooling system)	pH Temperature	6.5 to 8.5 Not more than 7 deg centigrade higher than the intake
Boiler Blow down	Free available Chlorine Suspended solids Oil & grease Copper (Total) Iron (Total)	0.5 100 20 1.0 1.0
Cooling Tower Blow down	Free available Chlorine Zinc Chromium (Total) Phosphate Other corrosion inhibiting material	0.5 1.0 0.2 5.0 Limit to be established on case by case basis by Central Board in case of Union Territories and State Boards in case of States
As pond effluent	pH Suspended solids Oil & grease	6.5 to 8.5 100 20

Source: EPA Notification [S.O. 844 (E), dt 19th Nov, 1986]

H. Guidelines for discharge point:

1) The discharge point shall preferably be located at the bottom of the water body at midstream for proper dispersion of thermal discharge.
2) In case of discharge of cooling water into sea, proper marine outfall shall be designed to achieve the prescribed standards. The point of discharge may be selected in consultation with concerned State Authorities/NIO.
3) No cooling water discharge shall be permitted in estuaries or near ecologically sensitive areas such as mangroves, coral reefs/spanning and breeding grounds of aquatic flora and fauna.

Source: EPA Notification [GSR 7, dated Dec. 22, 1998]

I. Site description of Wanakbori Thermal Power Station (WTPS):

1) Location of Industry : At- Wanakbori, Taluka :Thasra, District : Kheda,Gujarat-388 239, INDIA
2) It is a Coal Based Power Station; Total length of cables: 816 Km; Main water source for plant: Mahi River Jack Well; Average water consumption: 114756 cube meter; Total employees: 1791; Total Quarters in WTPS colony : 2074 .
3) There are total 7 units in power station. Each station have capacity of produce of electricity is 210 MW total installed capacity of 1470 MW .Commissioning dates of unit no. 1 to 7 are 23.03.1982, 15.01.1983, 15.03.1984, 09.03.1986, 23.09.1986, 18.11.1987 and 31.12.1998 respectively. All the above units are of BHEL make.
4) It is AN ISO-9001:2008, ISO-14001:2004, OHSAS 18001:2007 CERTIFIED PLANT.

They have primary treatment plant for used water and they are discharge the treated waste water into Mahi river as per GPCB norms. They have Ash dyke for the storage of waste ash. The total area of ash dyke is 343 hectors.

J. Process of effluent treatment plant

1) Sedimentation

The heavy particles or matters are settling down such as sand or soot dust from effluent. This process is including in primary treatment plant. It is works at zero gravity discharge no need to pumping.

2) Oil removal

The oily water from the Transformer Area, Turbine building, Workshop etc is collected in common collection sump from where water is pumped through the Plate Interceptor. Sludge generated from the Plate Interceptor or trapper is led to the Sludge Pit for further treatment. (Fig.1)

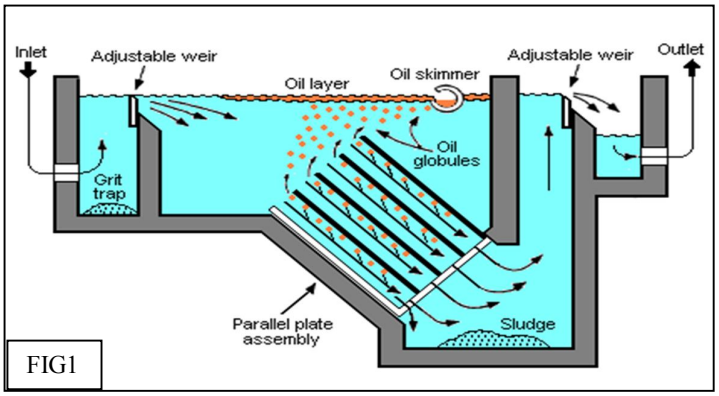


FIG1

3) Screening: A screen is provided at inlet of grit chamber or clarifier. It is used for removal of floating bodies like leaves and debris. Also removes oil and grease by providing a filter media.
4) Equalization Tank: Water washing effluent area is collected in common collection pit and then pumped to the flash mixer where chemical mixing takes place. The effluent is dosed with Alum, Lime and Polyelectrolyte to coagulate and flocculate the suspended / colloidal matter. Water then flows through the flocculation tank for flocculation and is finally carried over to tube/lamella settler through gravity where clarification of water takes place. Clarified water is then led to common monitoring basin through gravity. Sludge generated in the process shall be collected and pumped for further treatment.(Fig.2)
5) Filter press: Filter press is a separation process, specially employed by solid/liquid separation using the principle of pressure drive, provided by a slurry pump. Filter press is a fixed volume and batch operation. The major components of filter press are skeleton and filter pack. The skeleton holds the filter pack together while pressure is being developed

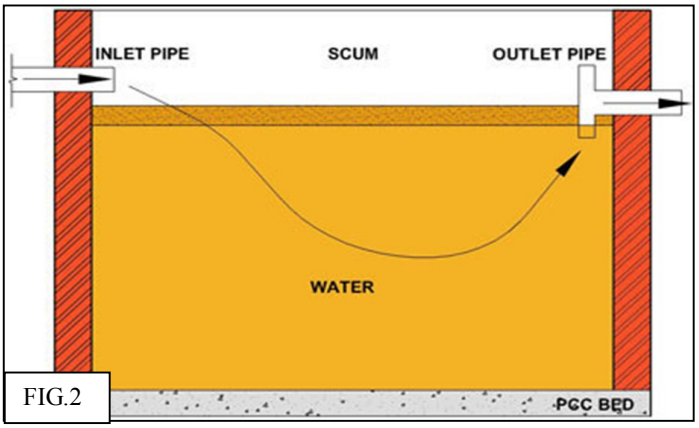


FIG.2

inside filter chamber. It however can only hold a specific volume of solids. (Fig.3)

FIG.3

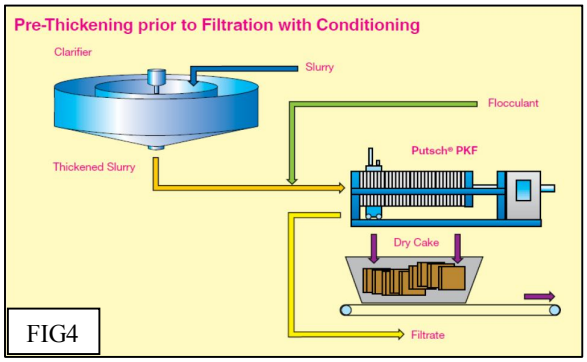
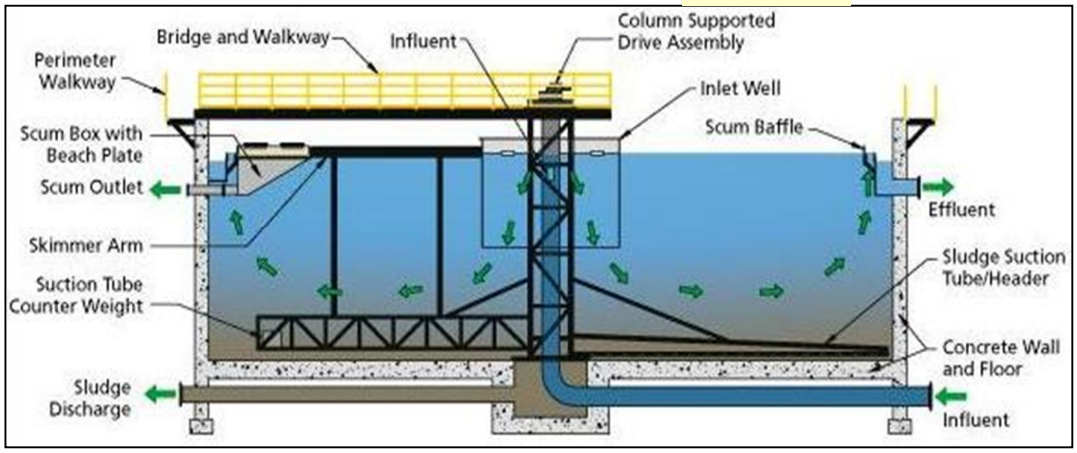


FIG4

- Materials: Filter plates are made from polymers or steel coated with polymer. They give good drainage surface for filter cloths. The plate sizes are ranged from 10 by 10 cm to 2.4 by 2.4 m and 0.3 to 20 cm for the frame thickness.
- Process: In operation, slurry is pumped under pressure into the press chambers through the manifold at the stationary head of the filter press. As each chamber fills with slurry, the liquid passes through the cloth medium, across the drain-field, through the drain ports and exits via gravity out of the corner discharge eyes. The prime function of the filter media is to provide a porous support structure for the filter cake as it develops and builds. Initially, some solids may pass through the cloth media causing a slight turbidity in the filtrate, but gradually the larger particles within the slurry begin to bridge the openings in the media reducing the effective opening size. This allows smaller particles to bridge these reduced openings initiating the cake filtration process. Once a layer of solid particles achieves 1 to 2 mm in thickness, this "precoat" layer serves to separate out finer and finer particles as the cake builds in thickness, yielding a filtrate that is very low in turbidity. (Fig.4)

K. Sectional elevation of clarifier



L. Effluent treatment plant at WTPS

The major aim of wastewater treatment is to remove as much of the suspended solids as possible before the remaining water, called effluent, is discharged back to the environment. Treatment at Wanakboriis typically subject to local, state and federal regulations and standards. Industrial sources of wastewater often require specialized treatment processes.Wastewater treatment includes physical, chemical and biological processes to remove physical, chemical and biological contaminants. Its objective is to produce a waste stream (or treated effluent) and a solid waste or sludge suitable for discharge or reuse back into the environment. This material is often inadvertently contaminated with many toxic organic and inorganic compounds.

III. CONCLUSION

A. There is no oil or grease separation method in existing plant. It is suggested that to use oil separator for removal of oil or grease.

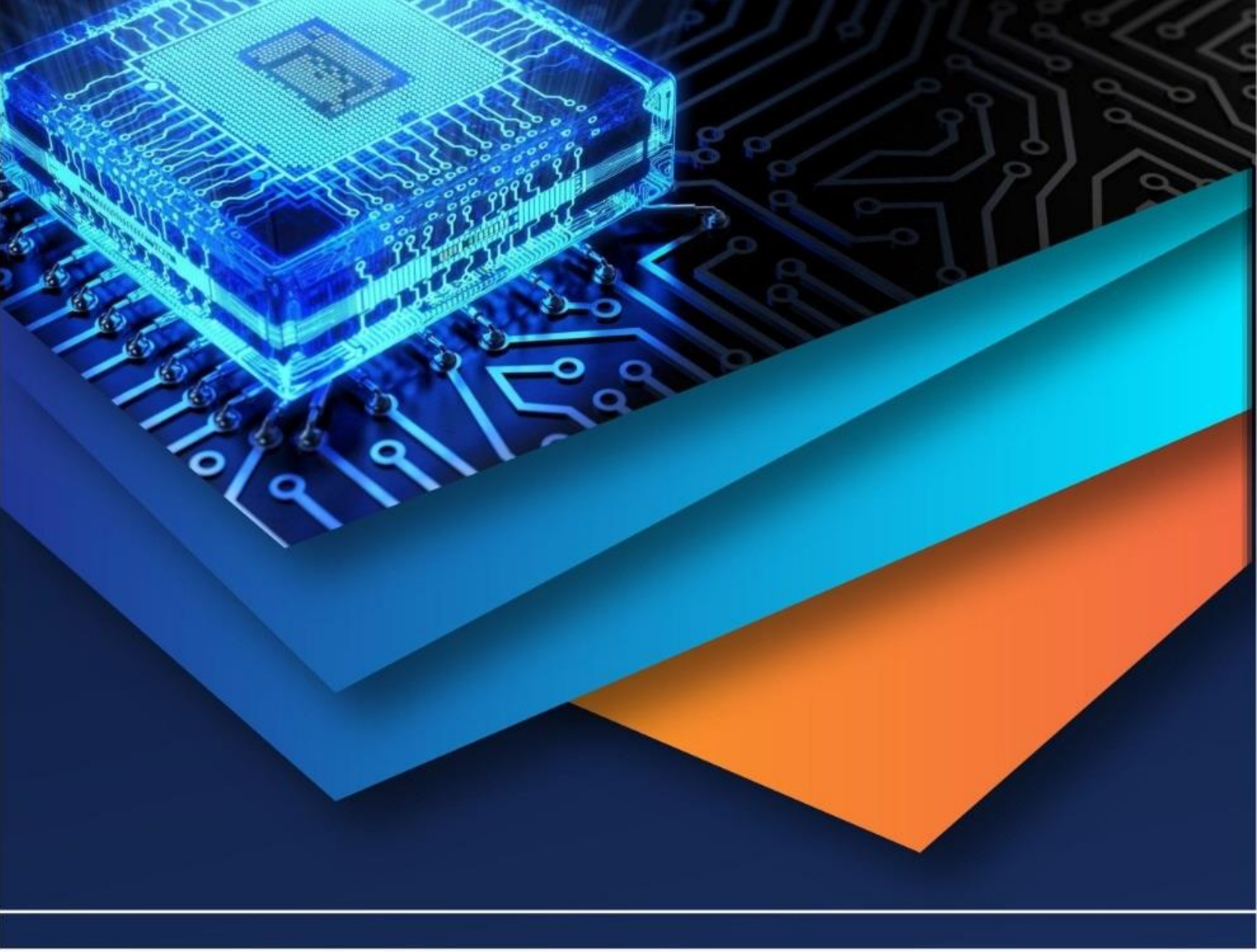
B. The particles of ash are very fine and light in weight so they are floating in water. No removal arrangement for floating particles. It canbe possible to use of SAND FILTER or FILTER PRESS for removal of floating particles of such as ash.

C. Using of high settling such as poly-electrolysis in Primary Settling Tank for removal of floating particles of such as ash. .

D. To achieve wastewater treatment for recycle or zero liquid discharge (ZLD) on an economical basis, it is not one technology that fits all, but one needs multiple technologies and careful integration of these. Each wastewater has its own nuances and to deal with these requires intimate knowledge of water chemistry and experience in the applicability of each technology. Besides technical feasibility, economic feasibility of a given treatment process for recycle is very critical and advancement in membrane processes has aided towards this cause.

REFERENCES

[1] POLLUTION CONTROL ACTS, RULES AND NOTIFICATIONSISSUED THEREUNDER (CPCB)
[2] Environmental Standards for Ambient Air, Automobiles, Fuels, Industries and Noise (CPCB)
[3] Enhancing water-use efficiency of thermal power plants in India: need for mandatory water audits (The Energy and Resources Institute)
[4] Physicochemical Properties of Fly Ash from Thermal Power Station and its Effect on Vegetation(Global Journal of Environmental Research 3 (2): 102-105, 2009)
[5] . 'Fly Ash Mission', Technology Information, Forecasting and Assessment Council (TIFAC), Department of Science and Technology, Ministry of Science and Technology, Government of India, Technology Bhawan, New Delhi, 1994.
[6] Senapati, M. R. and Banerjee, J., Advances in particulate emissions control. Paper presented at Institution of Engineers (India), Orissa, November 1999.



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY