



EFFECTS OF FLY ASH ON ENVIRONMENTAL AND SOCIAL LIFE

Engineering

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ABSTRACT

In India, about 70% of electrical energy is generated using coal as fuel in thermal power plants. Coal ash is a solid waste generated by thermal power plants where coal is used as fuel. As the need for power is increasing at a very fast rate for development purposes, the production of fly ash is increasing rapidly while generating electrical energy by thermal power plants. Disposal of this enormous amount of fly ash faces problems of huge land requirement, transportation etc. The problem with fly ash lies in the fact that not only does its disposal require large quantities of land, water and energy, its fine particles, if not managed well, by virtue of their weightlessness, can become air-borne. Soil consists of a mixture of weathered minerals and varying amounts of organic matter. Soils can be contaminated as a result of spills or direct contact with contaminated waste streams such as airborne emissions, process solid wastes, sludge, or leachate from waste materials. The solubility of metals in soil is influenced by the chemistry of the soil and groundwater. Factors such as pH, Electrical Conductivity, ion exchange capacity directly affect metal solubility. Surface water and groundwater gets contaminated by coal ash disposal from Thermal power generation plants. Groundwater and surface water are fundamentally interconnected. It is often difficult to separate the two because they feed each other. This is why one can contaminate the other. Hence to determine the contamination of groundwater and surface water tests such as oxygen content, pH value, conductivity, nitrate, ammonium. In this project we are going to discuss the Power sector in India, Coal as a product used for generation of electricity in thermal power plants, production of Coal Ash as waste from coal, Benefits & Utilization of Fly ash. Environmental and social issues due to Coal Ash, Water pollution, Groundwater pollution health related problems & most importantly "CONTAMINATION OF SOIL & WATER" is discussed in detail.

KEYWORDS

Coal ash, Environmental hazardous, Thermal power plant, social issues

INTRODUCTION

The economic development of any country is directly related with energy production & consumption of that country & hence, more thrust is being applied of late on the electrical power generation sector. Day by day electricity demand has been increasing rapidly in India. For day to day activities electricity is very important. The three major sources of producing electricity are thermal, hydro, wind. Hydro & wind does not leave any residual material but thermal leaves a major residual in the form of ash. In India power industries have been and continue to be a major contribution to the economic growth of the country. Though India has made tremendous progress in the past independence era, it faces formidable challenges in meeting the energy needs of the country. The energy sector and the India power sector will have the formidable challenge of helping the country sustain this growth. Power sector in particular represents one of the industries with highest environmental impact and has been subjected to increasing pressure from economics, energy saving and environmental issues. Gracefully many technologies to reduce the environmental burden and greening the supply chain in the power plant sector have been developed. Yet implementation of these technologies is not free from challenges. The fly ash contain high level of chloride compounds of calcium, sodium, and potassium as the major component, while it also contain considerably hazardous substances e.g. toxics heavy metals such as Pb, Zn, Cu, As, and toxic organic material such as dioxin which are concentrated and accumulated in the fly ash as minor component. India celebrated 100 years of hydro power development in 1997. Around that time, there were about 225 hydroelectric power stations (excluding mini hydro) in the country, with an installed capacity of about 23,500 MW, and generated about 80 billion units a year. By the turn of the century, the installed hydropower capacity was raised to about 25,000 MW. This was about 25 percent of the total installed capacity from all sources. In wind power, India ranked fourth in the World with installed capacity of 1025 MW, after Germany, USA and Denmark.

PROBLEM STATEMENT:

A. Environmental Effects

1. Air Pollution
2. Water Pollution
3. Soil Pollution
4. Radioactive Aspects
5. Other Effects

Fly ash particles are very light in weight so they easily get mixed with air in the atmosphere thus giving rise to air pollution. When this air is

inhaled by human beings it directly affects the respiratory system leading to harmful diseases like bronchitis, pneumonia & silicosis etc. Ground water as well as surface water both are polluted by fly ash. These pollution indirectly affects the aquatic & plant life of the region. The deposition of fly ash particles affects the top soil characteristic drastically. The deposition of fly ash particles on the plants interferes with the metabolic activities on plants & in due course of time, this will lead to destruction of plant life in the region. A certain amount of radioactive occurs naturally in the earth crust. Substance extracted from the earth's crust, including sand, clay, flint, marble, granite & coal, also contain radioactive material. When coal is burnt, the radioactive materials are left behind in the ash, which has a raised concentration of radioactive per unit weight. Working with such ash can therefore increase one's background radiation level.

B. Social Effects

1. Health
2. Income
3. Disputes Related to Land Acquisition

The Environmental Protection Agency (EPA) has found that living next to a coal ash disposal site can increase your risk of cancer or other diseases. If you live near an unlined wet ash pond (surface impoundment) and you get your drinking water from a well, you may have as much as a 1 in 50 chance of getting cancer from drinking arsenic-contaminated water. Arsenic is one of the most common, and most dangerous, pollutants from coal ash. In nearby areas of coal ash disposal sites, if there are villages nearby then due to the settling of fly ash on farms of villagers there will be a great impact because when doing the pre-farming works and then due to the fly ash content going below subsoil it will affect the crops produced. By settling ash on crops there are major effects on crops like the delay of Photosynthesis process which is ultimately the delay of crops produced after the season of particular crops. Due to increasing disposal of coal ash the demand required for disposal sites is more so nearby the disposal site it is by default to increase its area. So for that it is must to take some of the land of the nearby people instead of not having interest to give that land for the disposal site purpose. Also not giving them the required amount of their land in returns.

METHODOLOGY:

A. Government Norms

1. According to the regulation, The new coal thermal power plants are required to use 100% of the COAL ash produced within 9 years of commencing operation. CPCB & MPCB provide norms for utilization of coal ash.

2. Historically, wastes have always created a disposal problem. The problem of fly ash disposal has assumed such an enormous scale in the country that the Ministry of Environment and Forests (MoEF) issued a regulation on 14 September 1999 specifying normative levels for progressive utilization of fly ash.

3. According to the regulation, it is mandatory for the existing (old) and new coal based thermal power plants to utilize 100% of the fly ash produced in a stipulated time horizon.

4. The new coal thermal power plants are required to use 100% of the fly ash produced within nine years of commencing operation. The old power plants, however, are required to achieve 100% fly ash utilization goal within 15 years from the date of issue of the regulation.

Table – 1 Target Of Fly Ash Utilization & Its Duration

SR. No.	Target of Fly Ash Utilization (In Percentage)	Target Date
1	At least 50% of Fly Ash generation	One year from the date of issue of Notification
2	At least 60% of Fly Ash generation	Two year from the date of issue of Notification
3	At least 75% of Fly Ash generation	Three year from the date of issue of Notification
4	At least 90% of Fly Ash generation	Four year from the date of issue of Notification
5	100% of Fly Ash generation	Five year from the date of issue of Notification

Source: Report on Fly Ash generation at coal/lignite based thermal power stations and its utilization in the country for the year 2014-2015

B. Testing

1. Testing on water

- pH test
- Total hardness
- Chlorides

2. Testing on soil

- soil dilution (pH determination)

RESULTS OF TESTED SAMPLE

Table – 2 Results Of Water Sample Obtained From Well And Its Comparison With Bis Standards.

SR. No.	pH	Chlorides (mg/l)	Total Hardness (mg/l)
1	9.65	1969.37	1516
2	9.05	1944.64	1480
3	8.74	1862.25	1324
4	7.94	1870.49	1460
5	6.90	1854	1292
BIS LIMITS	6.5-8.5	250-1000	300-600

REMEDIAL MEASURES

A. Utilization of fly ash

Sustainable utilization of Fly Ash is one of the key concerns of NTPC. Utilization of Fly Ash is not only possible, it is essential. Today's quantum of production and the method of disposal do not lead to sustainability, but may instead lead to a series of catastrophes. As the demand for energy grows further, production of Fly Ash is inevitable, since India has no alternative but to use its relatively vast resource of poor grade coal- washed or otherwise. Fly Ash with its entire problem is here to stay; at least in the foreseeable future, though its negative impact can be minimized. In developed countries more than 80% Fly Ash is used for the manufacture of bricks, cellular concrete blocks, road construction, landfill application, ceramics, agriculture, insulating bricks, recovery of metals, and dam constructions. While in India about 10% ash is utilised currently in various segments include cement, asbestos-cement products & concrete manufacturing industries, land development, road embankment, building products such as bricks/tiles/blocks, reclamation of coal mine, ash dyke construction and as a soil amender and source of micro and macro nutrients in agriculture and only about 3% ash is utilised in other construction industry. In India "Fly Ash Mission of Government of India" is the nodal agency which undertook the responsibility for safe disposal and gainful utilization of Fly Ash on a sustainable basis. Due

to concerted efforts of the Fly Ash Mission, it has slowly become an acceptable material now and its intrinsic worth has been revealed to people.

1. Utilization of fly ash in agriculture
2. Utilization of fly ash in building material
 - Ready-mixed fly ash concrete
 - Precast fly ash concrete units
 - Clay fly ash bricks
 - Lime fly ash bricks
 - Lime fly ash cellular concrete
 - Sintered fly ash lightweight aggregate
 - Cement
3. Mine fills
4. Road construction materials
 - Utilization for stabilization and sub-base/base construction
 - Utilization of constructing semi-rigid/rigid pavements

B. Use of new material

Depletion of natural resources is a particular environmental concern to a highly technological society which depends on resources for energy, building materials and recreation. Exhaustion of natural resources viz., oil, mineral and timber will lead to deterioration in the quality of life. In order to maintain the present rate of technological development some alternative materials viz fibreglass, reinforced plastics and glass, reinforced gypsum have a great potential of use as building materials in place of present conventional materials like timber, steel etc.

C. Environmental control

1. Absorbent
2. Silage
3. Alkaline resistance fibres

CONCLUSIONS

We can conclude that as we go away from the disposal sites the pH, total hardness & chloride content decreases. Utilization of a huge amount of coal in thermal power plants has created several adverse effects on the environment leading to global climate change and fly ash management problems. Disposable management of fly ash from thermal power plants is necessary to protect our environment. It is advisable to explore all possible applications for fly ash utilization, which is already well established in various construction and waste solidification and stabilization processes. Fly ash addition could neutralize soil acidity to a level suitable for agriculture. Fly ash, now recognized as valuable substances which confers certain desirable characteristics in its many applications, helps in conservation of scarce minerals, reduce emission of greenhouse gases and enhance performance and durability of structure.

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