

“FLY ASH BOON OR BANE”

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Abstract - The combustion of coal give us the end product Fly ash (FA). Industries depend upon the primal material coal to generate electricity. The left-over of these mega industries has large portion of FA which is just a waste and needs to be dispose-off safely without harming the environment. This solid waste is growing day by day and need to be taken care off. After the several years of research it was proposed that it can be used in the agriculture sector as a nutrient provider and soil amendment. The major dispute which came and was the question of the hour, is the use of FA safe and sound due to presence of heavy metals and radioactive nature. The current researches had claimed that it can be used in the reclamation of the acidic soil and there is no accumulation of heavy metals inside the soil as well as plant parts which can be toxic. If sum up the things we can say that we can kill two birds with same stone first we can get rid from the tons of solid waste and we can provide the farmer a cheap source of nutrient which is free of cost. Government is also aiding in this process, there are many governmental policies which are helping for the safe disposal and usage of the fly ash in agriculture sector. May be in the near future it can be used as the major source of nutrient provider and helps to raise the socio-economic status of the farmer.

Key Words: Fly ash, soil amendment, nutrient provider,

1. INTRODUCTION

Natural resources has been exhausted to great extent which leads to various environmental constrains therefore it is the need of hour to find out the alternative source which does not cause the environmental pollution one such product is fly ash.

FA is the finely divided residue resulting from pulverized coal combustion and transported by exhaust gasses from the combustion chamber. In 2001, more than 61 million tons of FA (68 million tons) was produced. Coal-fired electrical and steam-generating plants produce FA. Typically, coal is pulverized and blown into the combustion chamber of the boiler with air where it ignites immediately, generating heat and producing a molten mineral residue. Boiler tubes extract heat from the boiler, cooling the flue gas and hardening and forming ash from the molten mineral residue. More than 20 million metric tons (22 million tons) of FA are used annually.

Coal is used as a major source of energy production particularly for generating electricity. According to recent data, India's electricity production capacity is 100,000 megawatts and 73% is generated by thermal power plants.

Mainly 85 units are dependent on the natural resource coal from our country's entire electricity generation model. The Indian coal has a calorific value range of 2800-4200Kcal / kg and is 35 to 50 percent abundant in FA. In addition to the good initial investment around one acre of land is necessary one megawatt power for production. In our nation 26, 300 hectare comes under FA pool.

FA has a major problem of solid waste and a growing pollutant to the environment. For the year 2007, proven global coal reserves were estimated at 847 billion tons. The United States holds the largest share of global coal reserves (25.4 %), followed by Russia (15.9 %), China (11.6 %) and India (8.6 %) Sarkar *et al.*, (2012). The annual production of FA is increased 1.0 million metric tons (MT) to 112 MT approximately in the year 1947 to 2005. FA production is expected to reach 225 MT annually by 2017, according to estimates from the FA Utilization Program (FAUP) Kumar *et al.*, (2005). Though FA can be used as a waste material for economic purposes such as construction, cement, industries etc. FA is basic in nature and contains high concentration of minerals. It is enriched with both macro and micronutrients. It can be used as a nutrient source for plants to improve the physical chemical properties of soils. FA however, may also have toxic metals (Rautary *et al.*, 2003, Lee *et al.*, 2006, Tiwari *et al.*, 2008). In agriculture, the use of FA provides a feasible alternative for its safe disposal to improve the soil environment and increase crop productivity. Kumar *et al.*,(2005) stated that FA has great potential to alter the physical properties of the soil therefore it act as good soil conditioner along with this it provides nutrient and vitamins to the soil.

1.1 CHARACTERSICS FEATURES

Coal - based thermal power plants from around the world face severe handling and disposal problems with the FA produced. The Indian coal's high ash content (30-50 percent) makes this issue more complex. Roughly 85 thermal power plants currently produce nearly 120 million tons of coal ash per year. The spherical shape of the FA particles ranges from 0.5 micron to 100 micron. It mainly contains crystalline and amorphous silicon dioxide (SiO₂) in two forms (smooth and rounded).

FA has physical and chemical properties. Including physical properties such as Specific gravity is one of the key physical properties needed to use coal ashes. The specific gravity of coal ashes is generally about 2.0, but it can vary widely (1.6 to 3.1). Distribution of grain size shows the weather of a

material that is fine, coarse, well graded or poorly graded, etc. Based on the distribution of grain size, coal ashes can be classified as sandy silt to silty sand. The chemical properties of coal ashes mainly affect the impacts of their use / disposal on the environment. The adverse effects include surface and subsurface water contamination with toxic heavy metals present in the ashes of coal, loss of soil fertility around the sites of the plant, etc. pH, and total soluble solids. The coal ashes are mostly alkaline in nature and having free lime and alkaline oxides which shows higher pH value. FA has lime reactivity because it contains high silica content. Generally the lime reactivity is high. The solubility of nutrient elements such as calcium, Sulphur, phosphorus; magnesium, iron, potassium and manganese affect the crop yield to a great extent. Coal ash density is an important parameter because it controls strength, compressibility and permeability. Ash permeability coefficient depends on the degree of compaction, grain size and pozzolanic activity. This spherical shape and uniform carbon ash grain size makes ash 5 to 10 times more permeable than soils with the same effective grain size. FA may contain different toxic elements depending on the sources of coals used by thermal power plants.

2. USES OF FLY ASH:

In the field of construction FA is known as the green building material. The Ghatghar dam in India is made up of fly ash talking about the world scenario the tallest building of the world Burj Khalifa is made using fly ash as building material. Surabhi (2017). It is used in the construction of roads due to its lower compatibility. The other properties like light weight it can be used for making the bricks which are stronger when compare to the ordinary bricks which saves the clay and red soil which is used more making of the ordinary bricks. The fly ash along with other admixture can be used as source of compost. FA can be used as herbal pesticide when mixed with turmeric, eucalyptus, tulsi and chili which were tested and found that they do not have any harmful impact of animal and human beings. (Sankari and Narayanasamy, 2007) The application of FA enriches the soil with macro and micro nutrients as well there were an increment in the organic carbon as it is a waste product which the industries want to dispose it is a cheap source of nutrients. A well-known soil amendment lime which is used to reclaim the acidic soil has been analyzed the cause of global warming according to IPCC (Intergovernmental Panel on Climate Change) it assumed that all the carbon present in the lime is lost to the environment in the form of carbon dioxide. Instead of the lime fly ash can be utilized which will reduce the global warming. Kishor *et al.*, (2010)

2.1 DISADVANTAGES:

The permeability of FA and durability of the cement are interrelated. Both are inversely proportional to each other. More is the permeability of the FA less is the durability of the cement. The poor quality FA has more

durability. The FA consists of many heavy metals like arsenic, lead and mercury. The plants accumulate large amount of these metals. The presence of lead and mercury can lead to many neurological disorders and can lead to cancer. It contains radioactive substances. There will be uptake of toxic metals by the plants when crops are raised by adding 5 to 20 percent of FA by soil weight. The application of the FA leads to reduction of microorganism an also hinders the enzymatic activities. Cimitile, M. (2009).

3. GOVERNMENTAL POLICIES:

The power plant using coal and lignite as raw material will bear the total cost of transportation of ash up to a radius of 300 Km under the Pradhan Mantri Gramin Sadak Yojana. According to the Ministry of Environment and Climate Change (MoEFCC) by changing the rules of FA has granted the permission that the FA can be used under agriculture sector and all the cost of will be bear by the power plant up to the radius of 300km. A notification by MoEFCC was given to all the power plant that there will be a 100 percent utilization of FA generated by them before 31st December 2017

3. CONCLUSION

The overall outcome is that FA can be safely used in the agricultural sector as per the scientist of Baba Atomic Research Centre the fly ash produced in India has low level of the radioactivity and it cannot be the limiting factor for the usage of FA. Another research claimed by FA Mission of Tifac reported that the grains, seeds and vegetables harvested from areas where tons of fly ash was applied have trifling amount of heavy metals. For the application of FA in a new area through research should be done. Optimum doses of the FA should be used to explore the benefit to the fullest. In the near future with proper study it can be one of the best sources which can be used in the field of agriculture for raising the economic status of the farmer.

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