

BIOTREATMENT OF POLLUTED WATER - VIS-À-VIS-SOCIO-ECONOMIC DEVELOPMENT IN COAL MINING AREA

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ABSTRACT

Coal being a primary source of energy, plays a vital role in an energy-intensive economy situation such as prevailing in India. Irrespective of the mining methods employed, mining is bound to cause various environmental problems and one of them is water pollution. Many problems related with water is scarcity, contamination and storage due to disturbance of groundwater aquifer by opencast coal mining. Coal mining and other related industries discharges water into river, streams and nallahs which goes as waste without any fruitful utilization. When this water drains through a large area of the mine it carries with it many soluble minerals that may present either in the coal or associated rocks, thus causing degradation of water quality. Besides this, sewage and industrial effluents water are also present in coal mining areas. Mechanical, chemical and other treatment methods for the sewage, mine and industrial effluents water found costlier. There is a bio-treatment option to recycle this polluted water for some useful purposes. This will not only save money & energy but also help in the upliftment of socio-economic status of the poor people living nearby. This paper discusses the concept and prospects of technology to be developed out of this approach.

INTRODUCTION

The recycling of sewage and industrial effluents in the mining and allied indus-

tries are generally done. But all the heavy metals and dissolved materials are not completely separated in general by the common process. If this has to be separated then the chemical treatments, electromagnetic, buffer solution, ion exchange, etc., are in general used which are costly and complicated process and can't be applied in every place and case (Nikhil, 2005).

In order to overcome this there were bio-treatment option to recycle this discharge mine water for some useful purpose. This will not only save money & energy but also promote sustainable utilization of waste water resource for fruitful purposes.

Bio-treatment of polluted water

The intensity of the problem of environmental pollution through mining and other allied industrial effluents and contaminated water has been well recognized in our country. Several mechanical and chemical methods has been developed for the same, but due to involvement of exorbitant cost or need substantial area of land and final disposal of the residue is still a problem. Bio-treatment approach with the help of aquatic plants may prove sustainable.

A group of suitable plants, called the macrophyte or halophytes, capable of carrying oxygen into the soil is planted on bed. The macrophytes may be Phragmites, Typha, Iris, Juncus, Schoenoplects, etc., and another set of plants which floats on the surface adsorb the heavy metals from the polluted surface water.

Among all the aquatic plants, water hyacinth (*Eichhornia crassipes*), vetiver grass (*Vetiveria zizanioides*), etc. were popular for the above purposes. Most of the common heavy metals that are in water are positive ions. One possible theory to remove them would be to put a negatively charged object into water and use it to attract the positively charged ions. This is essentially what we are doing when we put the roots of water hyacinth plant into the polluted water. The roots of many plants, including water hyacinth, have a negative charge to them. When this negative charges are present in the water it acts as magnet to the positively charged ions. The positively charged ions are attracted to the negatively charged roots. (Nikhil, 2005).

Socio-economical upliftment

Moreover, employment opportunity in coal mining areas has reduced due to economical policy change and hike in the coal prices. Further, the scope of employment is decreasing as industries are curtailing the present manpower due to economical crunch. In beginning, people joined the mining and other industries by leaving the prime work i.e. agriculture which is left behind since three decades. Now people leaving nearby areas of mining feel difficult to go back to their prime job agriculture due to easy retrieval of money by selling coal or doing job in the colliery as colliery labor. Time has changed and with this people are jobless. Huge forces of rural youth are still unemployed.

As a matter of fact some sustainable approach has to be developed to support the socio-economical development of these areas. In order to overcome

Table - 1
Techno-economical feasibility of water hyacinth and vetiver grass

S.N	Utility	Used As	Cost Benefit (in%)
Water Hyacinth			
1.	Food for Poor	Vitamins, Proteins and Minerals Diet	60.23
2.	Food for Livestock	Hay, Silage and Green Fodder	30.70
3.	Soil Additives and Fertility Improvement	Compost, Mulch and Organic Fertilizer	60.66
4.	Fuel	Briquettes	40.53
5.	Biomass	Rural Electricity	33.33
6.	Biomass	Cooking gas	33.45
7.	Bedding Material	Cultivation of Mushroom	30.29
8.	Industry	Ethanol and Butane-d-ol	37.66
9.	Health	Food Preservatives and Medicines	31.77
10.	Detergent	Soap Making	39.67
11.	Raw Materials for Cottage Industries and Handicrafts Items	Paper pulp, Coarse Textile, Fiber Board, Particle Board, Rope and Basket Making; Furniture Manufacturing	47.89
Vetiver grass			
1.	Food for Livestock	Green Fodder	42.44
2.	Soil Additive and Fertility Improvement	Mulch and Organic Fertilizer	66.67
3.	Biomass	Fuel	37.33
4.	Shed	Animal bedding thatch	30.37
5.	Bedding material	Cultivation of mushroom	29.66
6.	Aromatic Oil	Perfume, medicine and pesticides	41.29
7.	Raw Materials for Cottage Industries and Handicraft Items	Paper pulp, broom, hand-fan, decoration pieces	39.89

this there were bio-treatment option to recycle this discharge mine water for fruitful purposes. This will not only save money & energy but also promote sustainable utilization of these aquatic weeds resource for employment generation and eradicating poverty.

Water hyacinth

Water Hyacinth has many fold uses in rural areas (Nikhil, *et al.*, 2002) :

- Alternative of wheat flour with rich in protein, vitamins and minerals rich diet for the poor.
- Animal, Poultry, Piggery and Fishery Feed
- As cheapest source of compost, fertilizer and mulch
- As Fuel by making and using in the form of briquettes
- For the generation of electricity.
- For the generation of cooking gas.
- As bedding material for the cultivation of edible mushroom (*Valvaria* species).
- High level industrial chemical ethanol.
- For the production of preservative and medicines.

- For purification of polluted water.

Vetiver grass

Besides the polluted water treatment, vetiver grass also has many fold uses, which are as follows (Nikhil, 2004) :

- Leaves used as green fodder for livestock
- Old leaves and stem used as paper pulp
- As manure and mulch
- As fuel
- As animal bedding thatch
- Raw material for many handicraft items
- For perfume, medicines and pesticides
- For the cultivation of edible fungi
- Techno-economical Feasibility

Besides all the advantages, these two aquatic plants has economical benefit over the present methods like soil additive, food for poor and livestock, fuel, biomass, industrial byproducts, raw material for cottage industries and handicraft items etc., in rural areas (**Table1**). Further, using the water hyacinth and vetiver grass for the fulfilling above objectives wouldn't have any adverse effects and it is an integrated green-solution to almost all of the problems created by the mining and their allied industrial activities (Nikhil, *et.al.*, 2004).

APPROACH

The best approach for success in the rural area depends on the following :

- Administrative line-up with mining and allied industries for chain har
- vesting of these two weeds used for polluted water treatment by rural people as a raw material will save the labor cost for change over and transport to and fro to the industries
- Indigenous technology required for the product making
- Prototype made for product making based on manual
- Marketing Accessibility
- Strong Self Help Group and User Group in the village
- Coordination with Bankers, Marketing, District Officials and Users Group.
- Storage and Packing Techniques to be incorporated
- Training given to each individual for its product making
- R&D institutional backup required for quality check-up
- Continuous inviting entrepreneurs for investment and wide publicity.

CONCLUSION

These utilities of water hyacinth and vetiver grass are discussed as above but there is a need to develop simple low cost rural technology in order to self sustain the unemployed youth in the village itself. Moreover, the success of this program depends upon its wider utility. Government can assist this program by providing fund for the development of rural based low cost technology.

The outcome of this program will bring the efficient utilization of both these aquatic weeds for polluted water treatment in the mining affected areas for the sustainable socio-economical development.

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