International Journal of Research in Engineering, Science and Management
Volume 5, Issue 4, April 2022
https://www.ijresm.com | ISSN (Online): 2581-5792

Alternative Fuel Resource Facility from Hazardous Wastes of Chemical Industry

Jaymin Dineshbhai Bakre[1*], Anjali Nair[2]
[1]*Student, Department of Environmental Management, Shroff S. R. Rotary Institute of Chemical Technology, Bharuch, India*
[2]*Shroff S. R. Rotary Institute of Chemical Technology, Bharuch, India*

***Abstract*: In this study, waste Mix Pre-processing Facility to prepare Fuel for Co-processing in the Cement/Steel Plant and Drum Decontamination Facility for Captive Purpose Only. (Alternate Fuel Resource (Pre-processing) Facility). Main objective of cluster is to help members to address common challenges of hazardous wastes management and to control pollution specifically for hazardous waste having low to high calorific value. It will be processed and disposed to cement plants.**

***Keywords*: Pre-processing, Dumpsites, Waste to energy, Reuse of sludge, High calorific value, Hazardous waste.**

1. Introduction

About 6.2 million tonnes of hazardous wastes is annually generated in India, out of which around 3.09 million tonnes are recyclable, 0.41 million tonnes are incinerable and 2.73 million tonnes is land-fillable. This categorization of hazardous wastes into 3 classes is based on the hazard potential and its characteristics guiding its ultimate disposal, in accordance with the Hazardous wastes (Management and Handling & Transboundary Movement) Rules, 2008. Most of these wastes have characteristics suited to their utilization as resource material either for recovery of energy or materials like metals or their utility in construction, manufacture of low-grade articles or recovery of the product itself, which after processing can be utilized as a resource material. Hence a new mind- set treating the hazardous waste as a resource material rather than a difficult disposable material is the need of the hour.

The cost of providing incinerator would depend on its capacity ranging from Rs 10 crores to 30 crores. Assuming disposal cost of Incinerable hazardous waste is about Rs. 16,000/- per MT, it may roughly be estimated that additionally about Rs. 640 crore / annum would be incurred in incinerating hazardous waste in our country. Besides, incinerator if not operated optimally may contribute to emissions including toxic Dioxins and Furans. This coupled with resource conservation and reduced carbon emissions make a strong case for considering co-processing as a sound and better alternative for hazardous wastes disposal in general and Incinerable waste in particular.

Thus, the co-processing of hazardous substances in cement industry is much beneficial option, whereby hazardous wastes are not only destroyed at a higher temperature of around 14000 C and longer residence time but its inorganic content gets fixed with the clinker apart from using the energy content of the wastes. Apart from this, no residues are left, which in case of incineration still requires to be land filled as incinerator ash. Further the acidic gases, if any generated during co-processing gets neutralized, since the raw material is alkaline in nature. Such phenomenon also reduces resource requirement such as coal and lime stone. Thus, utilization of Hazardous wastes for co-processing makes a win –win situation.

2. Objective

The objective of the Project is to install a “Waste Exchange Cum Productivity Center” (Pre-processing facility) within the estate to pre-process waste such as Spent Sulphuric Acid, Spent HCl, Ammonium Carbonate solution, Iron Sludge, Gypsum Sludge, process Wastes having calorific value, Plastic Wastes, Distillation Residue, and Discarded Drums/Packaging Materials....etc which are liquid, solid or semi-solid and generated in large volume for their further co-processing into Cement Industries & Steel Plant.

3. Scope

This study will make industrial units of the cluster free from management, treatment and disposal of hazardous waste having various calorific value and will reduce the economic burden of the industries by way of economic and scientific waste disposal. This will support MSEs by addressing common issues of hazardous waste.

It is technically feasible and economically viable Project. The proposed project is economical viable solution for the treatment of High Calorific Hazardous waste.

This project is based on Waste to Energy Concept. It will reduce the financial burden on Member industries, so that they can focus on expansion of existing business

4. Study and Summary of Literatures

1) Use of the alternative fuels in the cement industry

In this literature, it can be concluded that concept of use of alternative fuels in cement industry is multiple useful from more different aspects. In fact, when subject is environmental protection, analyses indicated that emissions of harmful gases

*Corresponding author: jaymin.bakre@gmail.com

are reduced by using waste or old tires as fuel concerning fossil fuels. On the other hand, environmental is cleaned from waste which appearance is imminent

- Various types of waste such as: mixed municipal waste, bulky waste and other types of harmless waste can be processed in plants for mechanical biological processing of waste and can produce RDF (Refuse Derived Fuel).
- Fuel from waste or RDF is type of waste which is made by processing of waste, i. e. by shredding, separation of metal, stone, PVC plastic etc.
- This type of fuel is very similar with fossil fuel – stone coal.
- It is used as alternative energy source for production of energy and satisfies criteria which are specified by European standards CEN TC Solid Recovered Fuels.

2) Use of alternative fuels in cement industry by N. Chatziaras, C. S. Psomopoulos, N. J. Themelis

In this study, by using alternative fuel to make some reusable product.

Such as:

RFD - Refuse derived fuel, TDF - Tire derived fuel, TDF have lots high energy content.

- The use of wastes as alternative fuels by cement plants is both ecologically and economically justified.
- The use of alternative fuels will help reduce the costs of cement production. The average energy demand for the production of 1 ton of cement is about 3.3. GJ, which corresponds to 120 kg of coal with a calorific value of 27.5 MJ per kg.
- The environment and the cement industry, by substituting non-renewable resources with societal waste under strictly controlled conditions. The desired waste material, to be used as a fuel, is available within the state.

3) Increasing the use of alternative fuels at cement plants: international best practice by Michel Folliet James D. Michelsen, José Otavio Carvalho

The purpose of this study is the mixing of solid and pasty wastes with an adsorbent to produce a solid alternative fuel. Coarse blending in a pit and one or two steps of mixing within screens, extracting the foreign bodies.

To achieve a quality that is compliant with the main burner specifications, a shredder is mandatory. The most popular adsorbent is sawdust, but with the increase in the cost of sawdust, operators have been looking for alternatives; some plastics in foam form have been identified, but they have lower efficiency compared to sawdust.

- A good knowledge of the various waste sources that are available at a competitive price.
- All cement plants are not equal in their ability to replace a significant portion of their fossil fuel use.
- Control of waste pretreatment is critical to the quality and regularity of alternative fuels.
- The type of process, quality of the raw material, nature of the fossil fuel used, and behavior of the kiln all have a direct influence on the feasibility of a project.

4) Using alternative fuels in the production of cement by Bolesław Karwat, Dariusz Głowiński, Emil Stańczyk

This energy is generated by burning fine coal low-quality fuel oil (mazut), furnace oil, natural gas and, increasingly, alternative fuels. These fuels are obtained through the recycling process of wastes with suitable calorific value.

Cement plants use, among others, wastes plastics, - waste paper, - waste oil and solvents, - waste rubber and tyres, - waste from the textile industry, - dried sludge from wastewater plants,

- Considerable quantities of waste can be used for energy purposes. One of the programmes aimed at environmental protection consists of sustainable use of natural resources and waste management.
- Alternative fuels have attracted great attention in terms of their potential as substitutes for conventional fuels
- Waste is not stored on dumping sites or even in our households and do not contaminate the land or pollute air and thus do not cause harmful degradation of the natural environment.

5) Uses of alternative fuels and raw materials in the cement industry as sustainable waste management options by Alfonso Aranda Uson, German Ferreira, Eva Liera Sastresa.

- Decrease the environmental impacts, lower the consumption of energy and material resources, and reduce the economic costs of this industry.
- Because of the great potential for the cement industry to save energy and reduce greenhouse gas emissions (GHG), many new research advances associated with the promising approach of introducing waste materials as alternative fuels or sustainable raw materials into the cement manufacturing process have been developed in recent years.
- Therefore, the main objective of this paper is to provide a literature review of these approaches based on previously published research studies.

6) Alternative fuels for the cement industry by Eugeniusz Mukrzycki, Alicja Uliasz- Bochenczyk

- One of the main methods for utilising waste is its use as an energy source. Waste is only suitable for use as a fuel if it has a chemical energy content.
- This energy content depends most of all on the size of the (organic) combustible fraction and on the moisture content.
- To better employ the chemical energy contained in wastes, alternative fuels have been developed which are mixtures of different wastes. Some of these alternative fuels are: RDF etc.
- Research carried out for a number of years in cement plants all over the world has clearly shown the advantages of waste utilization in clinkering processes and cement production

7) Alternative Fuels on the Cement Manufacturing Plant Performance by Azad Rahman, M. G. Rasul, M.M.K. Khan, S. Sharma

- To reduce the energy and environmental costs cement producers are currently using a blend of alternative

fuels with conventional fossil fuels. Alkaline environment, high temperature and long processing time allow cement kiln to burn a wide range of alternative fuels including waste and hazardous materials.

- The usage of different types of alternative fuel and their impacts on the plant performance. The past research suggests that the maximum benefit can be derived by using an appropriate blend of different types of alternative fuels together with fossil fuels.

5. Conclusion

From the study, The Proposed project is economical viable solution for the treatment of High Calorific Hazardous waste. This project is based on Waste to Energy Concept. It will reduce the financial burden on Member industries, so that they can focus on expansion of existing business.

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