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Industrial hazardous waste management studies of nitrogenous chemical fertilizer factory in Vijapur, District Guna (M.P.) India

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ABSTRACT

Nitrogenous fertilizer industry generates high concentration of ammonia, urea, air emission (SOx, NOx, and COx SPM), ETP, sludge and spent catalysts wastes. These industrial hazardous waste of the NFL in Vijaipur are considered highly toxic in therefore disposal of such wastes needs proper attention so as to reduce possible environmental hazards. Industrial growth has resulted in generation of huge volume of hazardous wastes in the country. Hazardous waste management (HWM) is a very important issues and is assuming significance globally. Scientific disposal of hazardous wastes has become a major environmental issue in India. Hazardous waste (management & handling) rules, 1989 have been framed by Central Government and amended in 2000 and 2003 to deal with he hazardous waste related environmental problem that may rise in the near future. This paper gives details about the waste characteristics and management of NFL HW.

Key words: Industrial wastes, secured landfill, spent catalysts, fertilizer, hazardous waste, treatment, storage and disposal facility (TSDF).

INTRODUCTION

Hazardous wastes are man made activities, and adversely impacts human life and environment. The adverse impacts caused due to the indiscriminate disposal of hazardous wates (HWs). A number of potentially hazardous chemicals are now produced as finished products or by products.More than six million known chemicals, used in different Indian industries. Management of hazardous wastes has become a major concern in India as haphazard dumping of hazardous wastes results in severe environmental impairment. The adverse effect of hazardous as well as the significance potential risks posed by them to the life and its supporting system are increasingly recognized. Rapid growth of industries in India has resulted in generation of increasing volume of hazardous wates. However only, a few secured landfill sites are available in the country for disposal of hazardous waste in an environmental sound manner. An illegal dumping of hazardous wastes by the Industries may cause severe environmental pollution. The ministry of forests and environmental (MOFE) has promulgated hazardous wastes (M&H) rules 1989, as amended to date, wee notified in the country under the provision of the environmental (protection) Act, EPA, 1986, these rules were amended in 2000 and 2003, to bring the rules in line with the requirement of the based conversion and also to improve the applicability and implementation aspects with regard to imports of the hazardous waste. Apart from ministry of environmental and forests (MOFE), Central Pollution Control Board (CPCB), State Pollution Control Board (SPCB) /Pollution Control Committee (PCC) have been delegated certain powers for control and regulation of hazardous wastes. However, various issues and the regulatory frame work for hazardous management in the country should elaborately be understood in proper perspective by the regulatory agencies and industries to help the government to develop environmentally sound management system.

Waste characteristics of NFL

Sludge from effluen treatment plant (ETP)

The sludge from ETP 2300 kg. per day would be available which that mostly coming from ammonia plant, urea plant and nitric acid plant. The sludge (effluent) allowed to settle and dry within a period of six months. The observed sludge contain. Organic matter K,P, Ca, Na, N, Cr, Fe, Zn, Mn, Cu, and Cd. All these effluent impact the quality of soil and water bodies.

AIR emissions

Emission to atmosphere from ammonia plants, urea plant and nitric acid plant include : sulphurdioxide (SOx) Nitrogen oxides (NOx), Carbonoxide (COx), Hydrogen sulphide, Hydrogen cyanide, volatile organic compounds (VOCs), NH_3 and particulates (SPM). All these emissions pollutants of plant are the main source of Air pollution.

Solid wastes

Solid waste are principally spent catalyst that originate in ammonia production and in the nitric acid plant. Catalyst used in vairous processes has different useful lives ranging from 5 to 7 years. The plant authorities have not yet decided as to where the spent catalysts would be disposed off however, it was indicated that spent catalyst are commonly sold as scarp. Details of the various catalyts used in the plant are given in table-1.

Hazardous waste treatment approaches

Waste management systems involve a two tier universal approach viz. (i) preventation (ii) Control of environmental pollution. The preventive approach aims at minimazation of waste generation by all possible means of reduction through (i) improvement in process technology and equipment which may completely eliminate waste streams (ii) Improvement in plant operation, and (iii) promotion in use of process material and through recovery / recycling/reuse of waste. The approach for management of hazardous waste is also similar, but it has for reaching consequences if uncared for in view of its hazard potential.

The major obstacles is waste management in the country are more often instiutional behavioural rather than technical. The hazardous wastes are seldom segregated from the less pollutin/non polluting/recyclable wastes, thus increasing the volume of waste as also increasing the cost of

Table 1: Catalysts used in the plant

S. No.	Process	Catalyst	Quantity (tonnes)	Life (years)	Nature of spent catalyst
1.	Hydrosulfurisation	NiO & MoO_3	0.1270.678	5-7	Pyrophoric
2.	Desulphurisation	Zno	16.316	depends on the S-content in Natural gas	Non-Pyrophoric
3.	Primary reforming	NiO	6.355	5-7	Pyrophoric
4.	Secondary reforming	NiO	3.875	5-7	Pyrophoric
5.	High temperature shift converter	Fe_2O_3 & Cr_2O_3	96.700	5-7	Pyrophoric
6.	Low temperature shift converter	CuO ZnO & Al_2O_3	39.178 79.543	5-7	Pyrophoric
7.	Methanation converter	Ni	7.169	5-7	Pyrophoric
8.	Ammonia converter	Fe_3O_4	64.200	5-7	Pyrophoric

treatment depriving themselves of possible use of recoverables to minimize investment on raw materials. Ranking of options in hazardous wastes management follows the widely accepted hierarchical preference for waste management in general. Accordingly, waste avoidance and minimization ranks the highest followed by recycling treatment and safe disposal of waste generated.

Treatment of AIR emissions

In urea plants, wet scrubbers or fabric filters are used to control fugitive emisison from prilling towers. Fabric filter's are used to control dust emissions from bagging operations. These devices are an integral part of the operations to certain product. New urea plants should achieve levels of particulate matter in air emissions of less than 0-5 kg/t of product for both urea and ammonia. In nitric acid plants, extended absorption and technologies such as non selective catalytic reduction (NSCR) and selective catalyst reduction (SCR) are used to control nitrogen oxide in tail gases.

Treatment of cromium sludge and spent catalysts

The effluent which that originate in a nitrogenous fertilizer plant include boiler blow down, water treatment plant backwash, and cooling tower blowdown from the ammonia and nitric acid plant. They may require pH adjustment and settling. These effluents should preferable be recycled or reused. The sludge coming from ETP it contian 9.8 kg. of Cr per day or 3359 kg. per day. It procured for recycling in conventional agriculture or agroforestry, or can safely be recycled without causing food chain accumulation.

Catalysts used in the process need to be disposed off after their activities are significantly reduced. Normally, the catalyst used in the plant needs to be replaced at intervals of 5 to 7 years. These catalsyts are normally pyrophoric and have to be removed by taking certain standard precautions and stored in closed containers. These spent catalysts have ready market and are normally sold off, thus, as long as proper precautions are taken are not likely to pose any environmental problem.

CONCLUSIONS

Proper treatment, storage prior to treatment or disposal and safe disposal of HWs is the need of the hour in NFL. However, the sites to be selected for this purpose should fulfill certain criteria. It is difficult to develop alternative technology for total elimination of hazardous wastes generation. In devleoping countries, the thrust on economic development is often given priority to production costs than the best available technology and this result in more wastes generation. The cost of treatment and disposal of such wastes becomes a liability on the society. The MoEF has elaborately identified various treatment and disposal options of different hazardous waste streams that include physical/chemical treatment, landfill, biological treatment, incineration, recycle and recovery and solidification etc. As on today, the most often used option for disposal of wastes is secured landfill. The other options should be given also equal weightage to refuse and recycle of such wastes for resources recovery before deciding for a landfill. Environmental Impact Assessment (EIA) is being practiced all over the world to decide a site of secured landfill to ensure less negative impact of such facility on human and ecological systems.

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