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Characterization, Treatment and Disposal of Sludge: A Review

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Abstract— Treatment of industrial and domestic effluent is widely studied topic in the environmental engineering. Various techniques used for the wastewater treatment includes biological, physical and chemical treatments. Most common process for this is activated sludge process. The sludge developed in this treatment is concentrated with the pollutants in the wastewater. It is necessary to treat this sludge properly. This review summarizes the studies on characterization, treatment and disposal of the waste sludge.

Keywords— Sludge, pollutants, metal, treatment, disposal.

I. INTRODUCTION

Wastewater from industries can be treated by various methods. These methods include chemical, biological and physical treatments [1, 2, 3]. Advanced treatment techniques such as membrane separation and reverse osmosis can also be used [4]. Removal of organic matter by activated sludge process and trickling filters has been very effective [5, 6]. Heavy metal and pollutants like phenol can be removed by biological and physicochemical methods [7, 8, 9, 10]. In case of many treatment methods, the pollutants from the wastewater are removed. They are concentrated in the sludge which is the product of these treatment processes. This sludge needs to be treated effectively as it contains various pollutants from the wastewater. The current review aims at summarizing the research and studies on the sludge characterization, treatment and disposal.

II. METHODS FOR WASTE SLUDGE TREATMENT

Mesdaghinia carried out studies on wastewater characteristics of waste sludge of a treatment plant [11]. This sludge contained various components and needed to be treated and dealt with properly. On the other hand this sludge had benefits for plants and soils. Land application is preferred to dumping and disposing off. Zinck studied acidic drainage treatment for sludge with respect to disposal, reprocessing and reuse options [12]. According to the author, the current practices for sludge lack vision and long term planning. He discussed various options for treating sludge including conventional disposal technologies, reprocessing options for metal recovery, novel sludge reuse technologies and options for reclamation of sludge areas. Smith discussed management and reuse of sludge. The sludge production increases with more awareness about water treatment [13]. The sludge from treatment plant can be handled in various ways. According to the author, in Europe mesophilic anaerobic digestion was popular method. Kim et.al. carried out feasibility study of recycling residual solid from hydrothermal treatment of excess sludge [14]. The experiments carried out suggested that the residual solids could be easily converted to stable and non harmful substances through a stabilization process. So hydrothermal treatment was successful for this treatment. Viet et.al discussed the current status of sludge distribution transportation and disposal in Ho Chi Minh City [15]. According to the authors the sludge components were different in different types of sludge. Sludge from wastewater treatment plants and septic tanks was collected, transported and recycled to become organic fertilizer and Other types of sludge was disposed. According to Rockefeller; spreading sewage sludge on land is the latest in the compounding of environmental damage from sewerage. It is necessary to ban this practice [16]. Rizzardini and Goi discussed sustainability of domestic sewage sludge disposal [17]. The presence of metals and other pollutants puts question mark on the application of sludge in the agriculture. It is necessary to study the sludge with respect to its contains and effect on crops before using it as fertilizer. Gorgun and Insel carried out studies on leather industry sludge [18]. Many factors are involved in selecting best alternative for sludge treatment, dewatering and disposal. According to them, anaerobic digestion plays important role in the reduction of solids content as well as energy generation. The effectiveness of anaerobic digestion can be increased by chromium treatment and sulphate reduction. Hu et.al discussed recent development in sludge treatment for oily sludge [19]. This sludge is predominant in petroleum industry. Due to hazardous nature and large quantity, it is very important to have effective treatment for this sludge. They also discussed the origin, characteristics, and environmental impacts of oily sludge. According to them, any technology cannot satisfy all

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of the reuse and disposal requirements for different oily sludge wastes. Selection of the technology for treatment depends on sludge characteristics, treatment capacity, costs, disposal regulatory requirements, and time constraints. Various techniques such as incineration, landfill, and land used biological treatment, and bioslurry were discussed by them.

III.CONCLUSIONS

The treatment methods used for sludge treatment includes biological treatment, composting, land fill, incineration etc. The choice of the treatment method depends on the characteristics of the sludge and the amount of sludge. Sludge can be used as fertilizer in many cases. It is very important to study and characterize the sludge before it is used as fertilizer. It can be concluded that effective treatment and disposal of the sludge is very important for environmental and ecological point of view.

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