A Study on Sludge Management for Wastewater Treatment Plants by Using Biological Methods

Abdul Wahhab Jasim Mahdi (Iraq)

Department of Environmental Science,Acharya Nagarjuna University,
Guntur, Andra Pradesh, 522510, India.
Email: mr.wahhabmahdi@gmail.com
Phone: 08779843621

Abstract -**Water is the most useful and important source of life and life depends on it. When the wastewater is refined to return to the environment. A semi-solid side product and a rich nutrient called sludge are produced. Managing this side product, which has the least impact on the nature and health of humans, also responds to environmental standards and is economically feasible on the other hand. Conventional sludge management methods include disposal, agriculture, land use, and burning. Worldwide, more than 30 to 50% of sludge is processed and consumed in agriculture. Subsequently, land application is commonly used in sludge management, so that the sludge can be used to fertile the soil enrichment. Now that India adopts one or more methods for sludge management, it is a good opportunity to study the types of these methods.**

Keywords- ***Sludge, Wastewater, Management.***

INTRODUCTION

The wastewater treatment plants are commonly used for the physical and biological treatment of sewage, but today active sludge process is widely used for biological treatment around the world. The main reason for using this method is its economics and its easy strategy. Also, the quality of wastewater produced in these refineries is acceptable. But as a result of this method, a significant amount of excess sludge is generated that must be repelled. In such case, the treatment of sewage is done in several hours.

The process of sludge processing and its preparation for disposal is done for several days and involves the use of more sophisticated equipment. This is because sludge management costs are about 40 to 50 percent of the total wastewater treatment costs. Therefore, treatment, reuse and disposal of sewage sludge should be managed with due regard to the cost of effective management, environmental and health legislation in this area. One of the most important goals in the reuse and disposal of sewage sludge and during sludge processing is to eliminate pathogenic microbes and reduce carrier absorption. One of the most important goals in the reuse and disposal of sewage sludge and during sludge processing is to eliminate pathogenic microbes and reduce carrier absorption. False and incorrect management of sludge reuse will cause risks to both the public and the environment. Potential pollutants in sludge include nitrogen, metals, pathogens and synthetic organic compounds.

It can be said that the sludge is not unusable, but in the case of desiccation without any processing, it causes the sludge to become debris. In this paper, the classification of sludge has been investigated, reviewed and compare the common methods used in sludge management in the world. Biological methods in sludge management due to the economics and performance of some of these methods have been considered by chemical or physical methods. Some of these new methods will be examined in this paper and the challenge ,the issues ahead will be reviewed.

1.SLUDGE CLASSIFICATION

In the year 1993, laws were issued by the EPA of the United States Environmental Protection Agency (EPA), according to which the sludge should be physically, chemically and biologically reviewed and classified. The production of sludge is classified according to the physical, chemical and biological characteristics into classes A and B. Table 1 shows the Class A sludge regulations for use on the ground. The sludge produced in the Iraqi refineries has been class B to date, and according to environmental laws it is necessary to upgrade the sludge class for use and application. For this purpose, different methods are used in the world. In general, 92 to 98 percent of the sludge is water and the remainder is composed of corrosive organic matter. The high amount of organic material in sludge requires further purification before discharge and final disposal.

Heavy metals	Permitted Ceiling Concentration	Permissible Concentration	Annual rate of loading	Cumulative Loading Rate
Arsenic	75	41	2.00	41
Cadmium	85	39	1.9	39
Copper	4300	1500	75	1500
Lead	840	300	15	300
Mercury	57	17	0.85	17
Molybdenum	75	-	-	-
Nickel	420	420	21.00	420
Selenium	100	36	5.00	36
Zinc	7500	2800	2.00	41

Table No.01: Permitted concentration and loading rate of biological solids for application in Class A.

2. Sludge Management and Applications

Specifications of wastewater vary from city to city, due to the fact that the physical, chemical and biological processes different types of organic and inorganic materials are used for sewage. First, the sludge produced after digestion and after storage sampling is carried out to determine the chemical, physical and biological properties of sludge. Then appropriate processes are applied in the treatment of raw sludge. Conventional sludge management methods include:

1 - Agricultural use and use in the land
2 - Pumps
3 - Burning
4 - Disposal
5 - Other methods.

The processing and use of sludge depend on the conditions of the sludge, production volume and environmental conditions of the area and by adopting a suitable method. In addition to solving the problem of accumulation and contamination of sludge, it can be viewed as a commodity that has an economic aspect as well.

The adoption of each of these methods depends on environmental conditions. In Japan, for example, sludge is usually burned because it has a small amount of land. in the United States more than 605 million tons of dry sludge was produced. The sludge was used as ground application because slime can provide more than 50% organic nutrients. The use of sludge improves the physical, chemical and biological conditions of the soil. In published studies, it has shown better performance than chemical fertilizers. Table 2 shows typical methods for sludge management in some cities. Other methods mentioned include vermicompost production, use as a cover in landfills, etc., which is not common practice due to specific applications and conditions of use. Looking at the history of the use and management of sludge in industrialized countries, it can be seen that most of these countries are turning to exploitation and economical use of sludge.

Countries	Dry-Sludge Production (t/a)	Sludge Management Methods (%)			
		Agriculture	Burning	Disposal	Other methods
Switzerland	250000	50	20	30	-
Germany	2750000	25	10	65	-
Denmark	150000	43	28	29	-
Sweden	180000	60	-	40	-
Netherlands	180000	53	10	29	8
Australia	250000	28	37	35	-
Italy	800000	34	11	55	-
Spain	23000	61	-	10	29
Portugal	300000	80	-	12	8
British	1500000	51	5	16	28
France	900000	27	20	53	-
America	7690000	45	3	21	30
Japan	-	9	55	-	-

Table No.02: Production rate of sludge and the share of each of the common methods for sludge manageme in these countries in 2010.

3. Biological Methods in Sludge Management

Sludge applications are categorized into several types such as; the aggregates, land reclamation, brick industry, cement and application of coagulation, etc. One of the most important methods of reuse and sludge disposal is the irrigation of green and agricultural space, land rehabilitation, landfill, surface disintegration and burning. Burning sludge due to the need for high concentrations of sludge and the issues of controlling air pollution are expensive and complex. Sludge surface discharges from water treatment in the ground are also difficult because the selection of suitable land for disposal and supply of its special equipment, as well as the application of environmental laws and standards, will increase its cost.

3.1 Compost production

The production of compost using bacteria and aerobic microorganisms is possible in the process of composting, Complex biological activity causes an increase in the temperature of the sludge mass, thereby destroying many bacteria and pathogens, and, on the other hand, the use of volatile solids and the reduction of organic matter results in the stabilization of sludge and the production of compost. Factors such as temperature, humidity, pH, organic nutrients and oxygen concentration play a decisive role in this process, and all of these parameters must be controlled and optimized during the process to produce high-class compost. The composting of sludge has three general methods, namely: In-vessel systems, Aerated Static Pile, Windrow, the principles of the first two methods are the same, but the equipment used is different, such as how to cover and protect rain and etc. Compost produced from sludge is classified in two classes A and B. The most important difference in using these two composts is that there are restrictions on the use of Class B compost.

In order to achieve Class A according to the mentioned methods need for the following: Three days of time and temperature of 55 ° C using Aerated Static Pile Or inside the reactor. The duration of the Windrow method increases for 15 days at the same temperature. Of course, it should be noted that with new studies, the use of sludge compost is not far from risk and requires a more comprehensive design and study. Because, despite the use of this method, some diseases have increased in areas where compost has been used, and many countries and environmental organizations are currently examining these results and new tests.

3.2 USE OF SLUDGE DEPLETION RESIDUES IN GREEN SPACE

The use of sludge for agricultural land is an appropriate alternative to it. Water treatment sludge is not entirely excluded from the current rules of sludge application for agricultural purposes and should improve the productivity of agricultural land and ecosystem in the region. Such advantages and benefits can easily be considered for low amounts of sludge wastewater, such as water softeners for liming the land. The benefits of coagulation sludge application in agricultural lands are lower. Because of the negative effects on plant growth and contamination of groundwater and surface water because of high concentrations of heavy metals such as iron and aluminum. Joint application of sludge and sewage sludge to agricultural soils will result in plant growth. However, in soils used with sewage sludge, they have the highest plant growth, but instead of problems caused by heavy metals not available in sewage sludge.

3.3 USE OF SLUDGE IN WATER TREATMENT PLANTS IN LAND REMEDIATION

Application of sludge recovery and rehabilitation of land is an appropriate substitute for sludge treatment of water treatment plants. Tay and Shu, in a 1999 study, stated that the specific advantages of using these sludges are the buffering capacity of pH and the absorption capacity of heavy metals in the soil.

4.CONCLUSION

By expanding and constructing sewage treatment plants and exploiting large plans the management of sewage faces new problems and it is the production slurry of these plants, which ascends over time. This can bedone in two ways:

1. Reduce the amount of sludge and improve its quality by optimal purification.
2. Managing sludge according to global standards.

In recent years, most developing countries have improved their sludge management practices. Common practices that have so far been used for sludge management include recycling, burning, sanitation and composting using traditional, semi-industrial and advanced aerobic and non-aerosol systems. Also, attention is paid to new methods, such as production, Biodiesel or the use of novel methods for the purification and reduction of pathogenic microorganisms in sludge to be used as a rich blend of

organic compounds. Thus, several comprehensive studies for strategic management are required. It should also be considered that the use of sludge in agriculture, the production of biofuels, etc., can have many positive effects, but its environmental hazards should also be carefully considered.

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