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DESIGN OF SEWAGE TREATMENT PLANT AT WAWRULWADI

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ABSTRACT

This paper describes a review on development of anaerobic process and technology, involved for the treatment of domestic wastewater. In recent year there has been a growing interest for anaerobic processes over the conventional waste treatment techniques. The potential of producing usable energy makes the anaerobic biological processes unique. This feature has led to considerable fundamental research on anaerobic treatment systems specially Upflow Anaerobic Sludge Blanket (UASB) reactor over past three decades. The available literatures on the treatment of sewage and the applications of UASB reactor in India are reviewed in this paper.

Keywords: *Activated Sludge Process (ASP), Biological process, aeration, removal efficiency*.

I. INTRODUCTION

The handling of the inorganic wastes normally do not involve any biological treatment program because of the relatively inter nature of most inorganic matter as a substrate for microorganisms. One must don’t feel, however, that inorganic industrial wastes have no importance for natural biological processes in water. May inorganic wastes, because of high alkalinity, high acidity, toxicity to microorganisms, or utilization as food microorganisms or plants, may so upset the natural biological processes in waster. May inorganic wastes, because of high alkalinity, high acidy, toxicity to microorganisms, or utilization as food by microorganisms or plants, may so upset the natural balance of life in polluted waters that natural purification cannot progress normally. Also the zones of pollution and recovery in stream may be lengthened materially, to the disadvantage of other industries of communities.

The organic wastes, however, can frequently be treated b biologic method, with appropriate modification f the schemes used on domestic sewage. The latter half of this chapter will deal at some length with the methods used for treating organic industrial wastes.Vegetables grown in semi-urban areas, which use industrial wastewater for irrigation, have high levels of heavy metals such as lead, which is neurotoxic brain and cadmium, which can cause cancer, according to a new study by Indian and UK scientists.The study, carried out by researchers from the University of Sussex, Toxics Link (an NGO), Delhi University and Banaras Hindu University, established an “unambiguous relationship between heavy metals contamination in food crops and its source in wastewater from industries, treatment plants and municipal and domestic source.”Scientists said that in a rapidly urbanizing world, where there is increasing concern about fresh water shortage, the practice of using wastewater for irrigation of food crops in urban fringe (peri-urban) areas is encouraged. One potential risk of wastewater use is the contamination of food as a result of industrial pollution. It can have serious implications for the health and livelihoods of those that consume produce that was grown with wastewater irrigation and for the poor in particular.“Wastewater, used for irrigation in India, has no standards for heavy metals, though standards for bacterial content are there,” Mr. Ravi Agarwal from Toxics Link, said.

II. LITERARURE REVIEW

Er. DevendraDohare

Sewage is 99 % water carrying domestic wastes originating in kitchen, bathing, laundry, urine and night soil. Besides sewage also contains water borne pathogenic organisms of cholera, jaundice, typhoid, dysentery and gastroenteritis which originate from the night soil of already infected persons.

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AbdurRahman Quaff
Water is a vital resource that is used, misused, and wasted in society. Once water has been used, it becomes wastewater, which has its own characteristics and impact on the environment. Domestic wastewater (sewage) generated in urban area is one of the most urgent issues as the urbanization trend continuous globally.

G.Chandrakant
The increasing of population in pilgrimage area Tirumala near Tirupati in Chittoor District of Andhra Pradesh, observed as a result of the development of the modern societies is accompanied by concerns in the water sector, as a result of the increasing requirements for water supply and wastewater treatment. This situation justifies the evaluation of the system performance that covers protection of water resources & management. Poorly treated wastewater with high levels of pollutants caused by poor design, operation or maintenance of treatment systems creates major environmental problems, when such wastewater is discharged to surface water or on land.

Farid Ansari
The automobile industry's wastewater not only contains high levels of suspended and total solids such as oil, grease, dyestuff, chromium, phosphate in washing products, and coloring, at various stages of manufacturing but also, a significant amount of dissolved organics, resulting in high BOD or COD loads. The study reveals the performance, evaluation and operational aspects of effluent treatment plant and its treatability, rather than the contamination status of the real property.

Prof. PramodSambhajiPatil
The earth is divided into the lithosphere or land masses and the hydrosphere or the oceans, lakes, streams and underground waters. The hydrosphere includes the entire aquatic environment. Our world both lithosphere and hydrosphere is shaped by varying life forms. Permanent forms of life create organic matter and in combination with inorganic materials help establish soil. Plants cover the land and reduce the potential for soil erosion – the nature and rate of erosion affects the distribution of materials on the surface of the Earth. Two environments, biotic (living environment or community) and abiotic (non living environment), combine to form an ecosystem.

III. NECCESITY

Rapid Expansion of Wastewater Irrigation in the Coming Decades
The use of urban wastewater in agriculture is a centuries-old practice that is receiving renewed attention with the increasing scarcity of freshwater resources in many arid and semiarid regions. Driven by rapid urbanization and growing wastewater volumes, wastewater is widely used as a low-cost alternative to conventional irrigation water; it supports livelihoods and generates considerable value in urban and peril-urban agriculture despite the health and environmental risks associated with this practice. Though pervasive, this practice is largely unregulated in low-income countries, and the costs and benefits are poorly understood.This volume critically reviews worldwide experience in the use of wastewater for agriculture through a series of chapters defining and elaborating on the issues at the centre of the debate around wastewater use in agriculture. Particular emphasis is placed on untreated wastewater use through field-based case studies from Asia, Africa, the Middle East, and Latin America, which address the environmental and health impacts and risks of the practice. These chapters consider multiple aspects including the economic, social, health, agronomic, environmental, institutional, and policy dimensions and the research needs related to this growing practice. The editors conclude with a prognosis of future challenges and realities of wastewater use in agriculture.

Physical effects
These include impact on clarity of the water and interference to oxygen dissolution in it. Water clarity is affected by turbidity which may be caused by inorganic (Fixed Suspended Solids or FSS) and/or organic particulates suspended in the water (Volatile Suspended Solids or VSS). The latter may undergo biodegradation and thereby also have oxidation effects. Turbidity reduces light penetration and this reduces photosynthesis while the attendant loss in clarity, among other things, would adversely affect the food gathering capacity of aquatic animals because these may not be able to see their prey. Very fine particulates may also clog the gill surfaces of fishes and thereby affecting respiration and eventually killing them. Settle able particulates may accumulate on plant foliage and bed of the water body forming sludge layers which would eventually smother benthic organisms. As the sludge layers

accumulate, they may eventually become sludge banks and if the material in these is organic then its decomposition would give rise to malodours. In contrast to the settle able material, particulates lighter than water eventually float to the surface and form a scum layer. The latter also interferes with the passage of light and oxygen dissolution. Because of the former, these scum layers affect photosynthesis. Discharge limits on wastewater or treated wastewater discharges typically have a value for TSS such as 30 mg L^{-1} or 50 mg L^{-1}. Many industrial wastewaters contain oil and grease (O&G). While some of the latter may be organic in nature, there are many which mineral oils are. Notwithstanding their organic or mineral nature, both types cause interference at the air-water interface and inhibit the transfer of oxygen. Apart from their interference to the transfer of oxygen from atmosphere to water, the O&G (particularly the mineral oils) may also be inhibitory. Unlike domestic sewage, industrial discharges can have temperatures substantially above ambient temperatures. These raise the temperatures of the receiving water and reduce the solubility of oxygen. Apart from this, Rapid changes in temperature may result in thermal shock and this may be lethal to the more sensitive species. Heat, however, does not always have a negative impact on organisms as it may positively affect growth rates although there are limits here too since the condition may favor certain species within the population more than others and over time biodiversity may be negatively affected.

Oxidation and residual dissolved oxygen

As suggested in the preceding paragraph, water bodies have the capacity to oxygenate themselves through dissolution of oxygen from the atmosphere and photosynthetic activity by aquatic plants. Of the latter, algae often plays an important role. However, there is a finite capacity to this re-oxygenation and if oxygen depletion, as result of biological or chemical processes induced by the presence of organic or inorganic substances which exert an oxygen demand (i.e. as indicated by the BOD or COD), exceeded this capacity then the dissolved oxygen (DO) levels would decline. The latter may eventually decline to such an extent that septic conditions occur. A manifestation of such conditions would be the presence of malodours released by facultative and anaerobic organisms. An example of this is the reduction of substances with combined oxygen such as sulphates by facultative bacteria and resulting in the release of hydrogen sulphide. The depletion of free oxygen would affect the survival of aerobic organisms. DO levels do not; however, need to drop to zero before adverse impacts are felt. A decline to 3–4mg L^{-1}, which still means the water contains substantial quantities of oxygen, may already adversely affect higher organisms like some species of fish. If inhibitory substances are also present, then the DO level at which adverse effects may be felt can be even higher than before. The case of elevated water temperatures due to warm discharges is somewhat different. The elevated temperatures can affect metabolic rates positively (possibly twofold for each 10◦C rise in temperature) but elevated temperatures also reduce the solubility of oxygen in water. This would mean increasing demand for oxygen while its availability declines. Because of the impact of DO levels on aquatic life, much importance has been placed on determining the BOD value of a discharge. Typical BOD5 limits set are values such as 20 and 50mg L^{-1};

Inhibition or toxicity and persistence

These effects may be caused by organic or inorganic substances and can be acute or chronic. Examples of these include the pesticides and heavy metals mentioned in the preceding section. Many industrial wastewaters do contain such potentially inhibitory or toxic substances. The presence of such substances in an ecosystem may bias a population towards members of the community which are more tolerant to the substances while eliminating those which are less tolerant and resulting in a loss of biodiversity.

Eutrophication

The discharge of nitrogenous and phosphorous compounds into receiving waterbodies may alter their fertility. Enhanced fertility can lead to excessive plant growth. The latter may include algal growth. The subsequent impact of such growth on a waterbody can include increased turbidity,oxygen depletion, and toxicity issues. Algal growth in unpolluted waterbodies is usually limited because the water is nutrient limiting. While nutrients would include micro-nutrients like nitrogen, phosphorous, and carbon, and micro-nutrients like cobalt, manganese, calcium, potassium, magnesium, copper, and iron which are required only in very small quantities, the focus in concerns over eutrophication would be on phosphorous and nitrogen as quantities of the other nutrients in the natural environment are often inherently adequate. In freshwaters the limiting nutrient is usually phosphorous while in estuarine and marine waters it would be nitrogen.

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IV. SYSTEM DEVELOPMENT

Materials used in Purification

Steel Slag

Technically, slag is nearly any solid which melts and forms a silicate glass during a metal refining process. In the power industry, slag is ash which melts and sticks to the walls or pipes of the boiler. In the base-metal industry, slag's result from the smelting of various ores of copper, zinc, lead, etc. This slag's can have high concentrations of heavy metals. In this paper, we are only discussing slag's from the steel-making process. In making steel, iron ore or scrap metal is melted in combination with limestone, dolomite or lime. Pure iron is soft, bends easily under loads, and has limited uses. Small amounts of carbon, nickel, manganese, and other elements turn iron into various alloys of steel. There are hundreds of grades of steel ranging from basic carbon steel to high grade stainless. Steel making begins by reducing any metal oxides in the melt to pure iron metal, while scavenging ions such as aluminum, silicon, and phosphorous. The later three elements are bad news for steel as they cause it to become weak, brittle, or otherwise difficult to roll into sheet in a predictable way. For that matter, they make it nearly impossible to make anything useful out of iron.

Stone Aggregate

The chemical composition of aggregate is significant in determining the difference between limestone and dolomite. Limestone is a rock consisting mainly or wholly of calcium carbonate and has a tendency to polish smooth under traffic. Therefore, limestone is limited to use in low traffic-volume HMA surface courses. Dolostone under traffic maintains a higher-friction, skid-resistant surface and is used on higher traffic volume locations. Dolostone is a carbonate rock which consists largely of calcium magnesium carbonate. The word dolomite is the mineral calcium magnesium carbonate Ca Mg (Co3)2. INDOT uses elemental magnesium (Mg) content test to determine if a rock source is dolomitic. Elemental magnesium content of 10.3 percent or above is required for dolomite aggregates. Some aggregates have minerals that are subject to oxidation, hydration, and carbonation. These properties are not particularly harmful, except when the aggregates are used in Portland cement concrete. As might be expected, iron Sulfides, ferric and ferrous oxides, free lime, and free magnesia in industrial products and wastes are some of the common substances. Any of these substances may cause distress in the Portland cement concrete and give the concrete an unsightly appearance.

IV. CONCLUSION

Sewage treatment is not a cheap proposition. Public bodies have to think twice before making substantial investments particularly in developing countries where environmental issues could not be given priority due to financial constraints. During the past three decades, several new sewage treatment technologies have been developed and are being adopted in many developing countries particularly in the South-East Asian region including India. Every technology has its pros & cons and therefore has to be applied in accordance to the local conditions.

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