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Industrial Wastewater Treatment

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ABSTRACT

Waste water treatment consists of different processes which protect the environmental and human health through cleansing the water pollutants. In the past people used to have different methods for this treatment which has been passed over or developed through history, due to the advancement of technology and the growing needs of society .Waste-water treatment is a vital process in the modern industrial world, alongside this, more 97% of water is the stored in saline (oceans) and only 3% fresh water however only less than 1% is available for consumption. As time goes by, there will be population growth for which the government would have to provide more useable water for society. Waste-water treatment uses chemical, physical, and biological process to cleanse waste water in order to protect the environmental and public health .Waste-water is the water which has been released to environmental that is defined as a combination of the water plus wastes that have been added to the water from a verity of uses, such as industrial, commercial, residences etc and there to sources which release the waste water into the environmental. First, community waste water is the kind which has been expelled from domestic premises such as institution, residence and commercial establishments which are organic because of the consistency of carbon composites alike vegetables, human wastes, paper etc. Second, is the waste-water that has been produced by industrial procedures which is also organic in composition. Although this literature introduces the verity of waste-water treatment techniques and sewage system design generally.

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INTRODUCTION

Natural water is seldom chemically pure. When it rains, organic and inorganic suspended particulate matter, gases, vapours, mists, etc. in the air get dissolved in water, through which it reaches the earth's surface. In addition, water carries surface pollutants and contaminants during its flow over the ground. Water, which percolates into the ground, dissolves various salts and becomes rich in total dissolved solids. Thus, it acquires a number of impurities while in its natural state. This necessitates adequate treatment of naturally occurring water before it can be used for domestic, industrial, commercial, agricultural or recreational purpose. The extent of treatment will depend on the end use of the treated water. Use of the treated water even once adds considerably to the amount and variety of pollutants. This necessitates further treatment of the water before it can be reused, although it is not strictly necessary to have water of uniformly high quality for each of the above uses. In view of the limited availability of water for meeting our growing demands, and in the interest of protecting the environment, it is essential to thick and act in terms of reducing water consumption, reusing and recycling once-used water, and minimizing the pollution effects of waste water resulting from a variety of uses.

Although the law and regulations that require industrial wastewater treatment are constantly changing, the

fundamental principles on which treatment technologies are based do not change.

The fundamental idea upon which the approach suggested in this paper based can be stated as follows: If the mechanisms by which individual pollutants becomes incorporated into a waste stream can be identified analyzed and describe, the most efficient methodology of removal, or treatment, will be obvious.

As an example of the usefulness of this approach to quickly develop an effective, efficient treatment scheme, the leach ate from a landfill was to be pre-treated, and then discharged to a municipal waste water treatment facility (publicly owned treatment works [POTW]). Because the waste sludge from the POTW was to be disposed of by land application, a restrictive limitation was placed on heavy metals in the pre-treated leach ate. Analysis of the leach ate showed that the content of iron was relatively high. Other metals such as cadmium (probably from discarded batteries), zinc, copper, nickel, and lead were also present in excess of the concentrations allowed by the pre-treatment permit, but substantially lower than iron.

Water molecules are polar. This polarity arises from the spatial arrangement of protons and electrons in the individual hydrogen and oxygen atoms that make up each water molecules. An orbital is a region in space where, according to the theory of quantum mechanics, an electron is most likely to be found. Below fig. Is a two dimensional portrayal of the three dimensional hydrogen atom, but is sufficient to show that, at any given instant, the negatively charged electron is able to counteract the positively charged nucleus within small region of the space that the atom occupies.

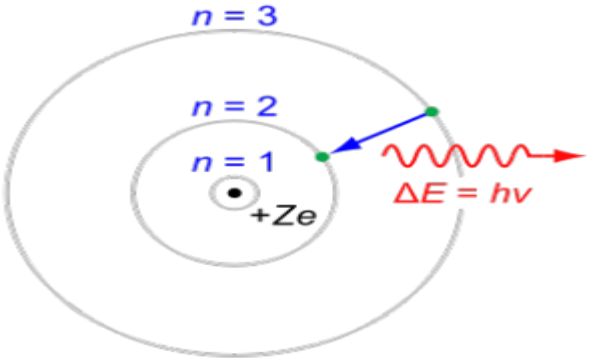

Figure: Diagram of a hydrogen atom.

Wastes from industries include solid wastes, air pollutants, and waste waters.

Waste water discharges are regulated by the Clean Water Act, as amended (as well as other federal and certain state laws and regulations). However, the three categories of wastes are closely inter-related, both as they impact the environment and as they are generated and managed by individual industrial facilities.

LITERATURE SURVEY

Most states have had regulation forbidding "pollution" of surface water and ground water since well before the 1950s. For instance, the Pennsylvania state legislature pass the clean streams act in 1937, which create the sanitary water board and empowered it to administer the law, as interpreted by the board and implemented by a "bureau". The clean stream prohibited the discharge of industrial waste to "waters of the commonwealth" which included the groundwater, as well as surface water. "Industrial waste" as broadly defined as any liquid gaseous or solid substance, not sewage, resulting from any manufacturing or industry. As one of its first item of business, the board issued a number of rules, including a requirement that all facilities for industrial waste treatment must applied for and be granted a permit before commencing construction. The Pennsylvania Department of Health served as administrative and enforcement agent for the sanitary water board.

Water pollution control

The foundation of federal, state and local water pollution control law and regulation continued to be PL92-500, the 1972 amendment to the clean water act. Before passage of these water shade legislation, water pollution control laws were based on an approach that focused on water quality standard and effluent limitation standard tailored to thus standard. The degree of treatment required of given industrial discharger depends on the assimilative capacity of the receiving water body. The foundation of these approach was that the "solution to pollution is dilution" and the amount of dilution available was the basis of the degree of treatment required. One doctoral thesis, written during the late 1960s, used dissolved oxygen monitor in a river to control a value to regulate the rate of discharge from an industrial facility. The flow of treated industrial wastewater to the river was from reservoir into which the effluent from

the treatment plant. Treated waste water would build of in a volume in the reservoir when the available discharge to the river was low, and the reservoir would empty into the river during the period when the allowable discharge rate (as indicate by the relatively high concentration of dissolve oxygen in the river) was high.

CHARECTERISTICN OF INDUSTRIAL WASTE WATER

Although the characteristic of the industrial waste water usually vary from industry to industry, and also vary from process to process even for the same industry, yet industrial effluent as group differ widely from normal domestic waste obtained from residence and commercial establishment. They have ideal too high a proportion of suspended solid, dissolve organic and inorganic solid, BOD, alkalinity or acidity, and there exit in a normal domestic sewage. The Pollutant in the industrial waste water include the raw material, process chemical, final product process intermediates, process by product and impurities in raw material and process chemical. Such industrial waste water cannot always be treated easily by the normal method of treating domestic waste water, and certain specially designed method or sequence of method may be necessary.

BOD

The standard 5-day BOD test is most commonly use method to estimate the total quantity of biodegradable organic material in the waste water. The result of the 5-day BOD test (abbreviated BOD5)are considered to be estimate of the amount of oxygen that would be consumed by microorganisms in the process of using the organic material content in a waste water for food for growth and energy. Some of the organic material will thus be converted to additional microorganisms. Some will be converted to carbon dioxide and some to the water.

COD

Chemical oxygen demand (COD) is a second method of estimating how much oxygen would be depleted from a body of receiving water as a result of bacterial action. Whereas the BOD TEST is performed by using a pollution of bacteria and other microorganisms to attempt duplicate what would happened in a natural stream over a period of 5days, the COD test use a strong chemical oxidizing agent, potassium dichromate or potassium permanent, to chemical oxidized the organic material in the sample of wastewater under the condition of heat and strong acid. The COD test has the advantage of not being subject to interference from toxic material as well as requiring only 2 or 3 hours for the test completion, as a opposed to 5days for the BOD test

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PH, ACIDITY AND ALKALINITY

The term Ph refers to the concentration of hydrogen ion in an aqueous solution, where "aqueous solution" means either pure water with small (in terms of molar amount) quantities of substance dissolved in it. Strong solution of chemical such as one molar sulphuric acid or a saturated solution of sodium chloride do not qualify as aqueous solution .In those solution the normal ph. range of 0 to 14, which equal the negative logarithm of the hydrogen ion concentration in moles per litter, has no meaning. Because the ph. of an aqueous solution is numerically equal to the negative solution of the hydrogen ion concentration (In moles per litre) and can be readily calculated using the following equation,

$$Ph. = \log 1/H^{+}$$

D.O.

Dissolve oxygen (D.O.) concentration is usually determine by either a wet Chemistry method known as "the aside modification of the Winkler method "or by use of a probe and meter. The wet chemistry method is considered to be the standard for comparison, when the colour and the other properties of the aqueous solution (industrial waste, etc.) do not preclude its use; however, the probe and method is the most commonly used.

Total solid

Substance can exit aqueous solution in either the dissolved or the dissolved state. The residue that is left after evaporating a sample of water act 103degree C is referred to as the total solid s value of that sample. It is generally regarded as everything that was in the sample that was not water, however, any of the substance originally present, organic or inorganic that volatilized at 103degee C or less will not be in the residue. Figure 6-5 present a schematic breakdown of substance that can be measured as total solid in a sample of water.

SUSPENDE SOLIDS

Solid that will not pass through a 0.45 micron filter are referred to as total suspended solids (TSS). Because standard method of measuring TSS involves shaking the sample thoroughly before filtering, the TSS actually includes all undisclosed solid as appose simply the dissolve solid that will not settled under the influence of gravity.

COLOR

Colour is measured using visual comparison to and arbitrary standard. The standard is normally made by dissolving potassium chloroplatinate (K_2 $PtCl_6$).

WASTE WATER TREATMENT SYSTEM

The wastewater treatments or sewage treatment is a broad term that applies to an any process , operation are combination of processes and operation, that can reduce the objectionable properties of water carried waste and render it less dangerous and repulsive to man. Thus, the wastewater treated before it ultimate disposal in order to: a) reduce the spread of communicable disease cause by the pathogenic organism in the sewage and b) prevent the pollution of surface and groundwater.

Wastewater treatment is a combination physical, chemical and biological processes method of treatment in which the application forces predominate are known as unit operation. There are three type operation and processes

1) Physical unit operations
2) Chemical unit processes
3) Biological unit processes

Physical unit operations are those in which application forces predominate. They consist of screening, mixing, flocculation sedimentation, floatation etc. chemical unit process are those in which removal of contaminant of brought about by chemical activity. Common example of chemical unit process: chemical precipitation, gas transfer, adsorption, ion exchange, electro dialysis etc. Biological unit processes are these in which the removal of broad about by biological activity.

Methods of treatment

Treatment of industrial wastewater generally consist of one or more of the following process (1) Equalization, (2)Neutralisation,(3)physical treatment(4)chemical treatment and (5)biological treatment.

1. Equalization: when the characteristic of the wastewater varies during the day and also when discharge is not uniform or else is discontinuous, equalization is necessary. The process of equalization consist of holding the wastewater for predetermined time, in continuously mixed holding tank\basin so as to get wastewater uniform rate. Thus, equalization needs adequate storage.

2. Neutralization: This is the necessary when the waste water contains either excess alkali or excess acid, and is achieved by the addition of either acid or alkali respectively. This may be done either in the equalization tank, if the condition so permit, else in the separate neutralization tank.

3. Physical treatment: This treatment is similar to primary treatment of domestic waste water. Various processes that fall under this head are: (1) screening, (2) sedimentation, (3) floatation and (4) Primary sedimentation becomes essential when the waste water contain high percentage of settle able solid. Floatation is provided to remove the finer particles. In floatation, the rising air bubbles lift the finer particles to the surface form where these are removed by skimming.

4. Chemical treatment: This is the one of the essential part in the treatment of industrial waste water, especially for those which is amenable to biological treatment. Sometimes, physic-chemical treatment is applied to the industrial waste water, either in absence of biological treatment or in conjunction with biological treatment. Various chemical and physic-chemical processes that are used for industrial waste water treatment are: (1) Coagulation, (2) chemical precipitation, (3) hyper-filtration or reverse-osmosis, (4) chemical oxidation, (5) adsorption, (6) ion exchange, (7) air stripping, (8) electro dialysis, (9) thermal reduction.

5. Biological treatment: This is the resorted to only when industrial waste water contains large quantities of biodegradable substances. If the BOD/COD ratio of the industrial waste water is more than 0.6, it is the biological treatable. If the ratio is less than 0.6 but is up to 0.3, acclimatisation is necessary before the biological treatment. If, however, the ratio is less than 0.3, biological treatment is not necessary. Acclimatisation is a process of seeding or rising initial microbial population under the controlled conditions, by gradual exposure of the waste water in increasing concentration. Various biological treatment methods that can be used are: (1) Activated sludge process, (2) trickling filter, (3) oxidation pound, (4) aerated lagoon, (5) oxidation ditch.

CONCLUSION

Every industry produces industrial waste water. If it is allowed to accumulate, it will get decomposed and will contaminate water. Hence it is essential to remove the contaminants from the wastewater through appropriate treatment methods.

It is conclude from industrial waste water treatment their effect on aquatic environment, analysis, characterization. Conducting treatability studies. The text are also provides information to enable process designer to arrive at a suitable form of treatment of waste water .Attempted to show the reader that it is technically possible and economically feasible to reduce and ,in some cases, eliminate pollution caused by industrial waste water.

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