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Innovative water treatment Technologies to Remove Harmful Contaminants in Treatment Process- Case Study

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Abstract

Scarcity of water day by day leads to domestic wastewater management and recycle the same for the use of general purposes. Here the authors have taken a keen interest to remove harmful contaminants in treatment process from domestic waste water. After the effective treatment of the waste water the same may be returned to almost any point in the water cycle. Near about 30% of daily water need can be filled by the treated water on the other hand the segregated sludge can meet the demand approximately 25% of agricultural fertilizer. In the treatment process Ph value of water in different treated tank varies from 6.2 to 8 and the maximum value of CO_2 present in water is 6.6% at 25^0-day temperature, it may be the cause of present of geo-plankton or green microorganism those are highly stable at 25^0 centigradewater temperature. The highest amount of dissolved solid particles observed 750 ppl present in highly contaminated water and the percentage reduction of solid dissolve particles is reduced to 95% at the end of treatment process.

1. Introduction

Demand of freshwater gradually increases with the increase of population in the world. It is estimated from the fact that if all sources of water available on the planet that is oceans, lakes and rivers, the underground aquifers, and in glaciers could be spread over the surface of the earth would be flooded and the height of water would be in few kilometres. Despite of huge availability of water in the world there are near about 2/1 billion people are suffering from sufficient water at their needs.

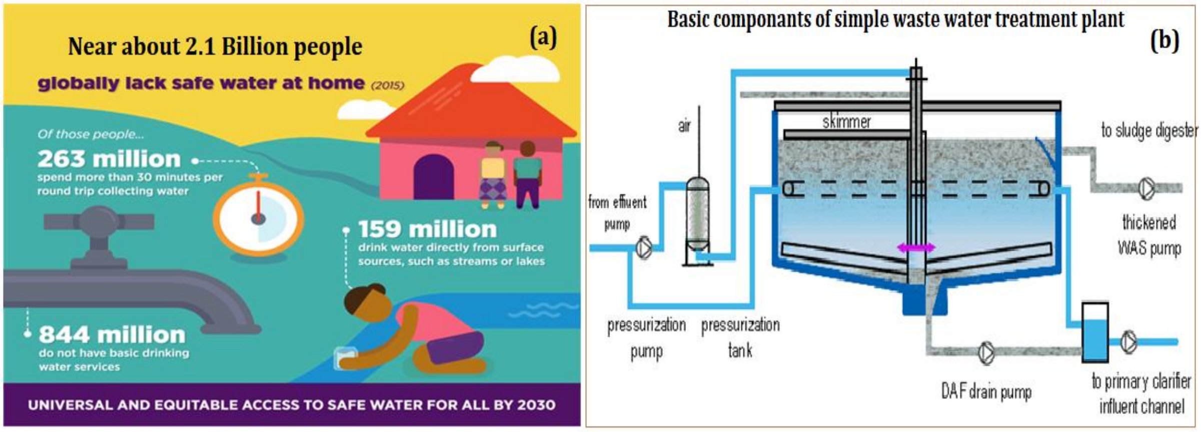

Fig.1.1 is clearly depicting the availability and shortage of fresh drinking water in the globe and fig1.1(b) showing the common water treatment process.

water reclamation is the process of converting wastewater into usable water that can be reused for other purposes of living being.

Near about Ninety-seven (97) percent of the available water rest in the oceans and in rivers only three available for meeting the needs of living beings. Presently the world is facing huge water scarcity and the need of diligent and economical use of natural water resources along with identification of alternative. From the last decades there are few anthropogenic or herbal new recognised compounds are found in the waste water these contaminants are harmful for environment and use for living being. Most of these contaminants are organic in nature and normally present within concentrations from components per trillion (ppt or ng/L) to components per billion (ppb or µg/L) (Rodriguez-Narvaez et al. United States Geological Survey described “emerging contaminants (ECs)” as "any chemical of artificial or herbal starting place or any microorganism that is now not generally monitored in the surroundings however has the achievable to motive unfavourable ecological and/or human fitness effects" (USGS, 2017).

Fig.1.2 is clearly representing the availability of harmful emerging contaminants and their source of generation

Few techniques are used for lessening/stop the significant dissemination of ARGs.Waddlia chondrophila, sapoviruses, tetracycline ARGs [tet(O), tet(S), and sulfonamide ARGs (sul(I), ECs are new compounds that are notably defined by the United States Environmental Protection Agency (USEPA) that are harmful and influences on the fitness of residing beings and the surroundings (de Oliveira et al.). These injurious chemical compounds in environmental media are no longer a new phenomenon that was noted in 2000 years in the past with the emergence of the oldest international contaminant, lead due to over exploitation of lead mines by way of Romans and Greeks (Sauvé and Desrosiers, 2014). sul (II))] are few examples of rising microbial contaminants (Hartmann et al.,)

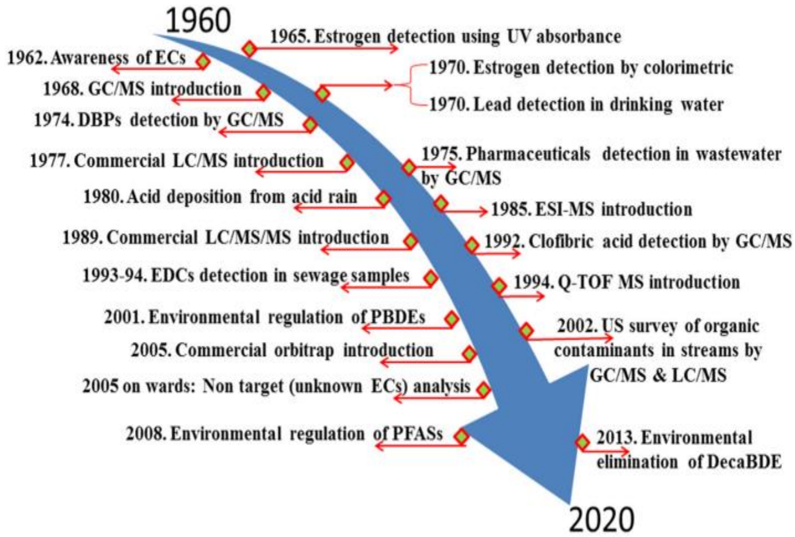

Fig.1,3 is clearly demonstrated that the different water contaminants and their detection in varying laboratories with the years of origin

ECs are new compoundsthat are notably defined by the United States Environmental Protection Agency (USEPA) that areharmfuland influences on the fitness of residing beings and the surroundings (de Oliveira et al.). These injurious chemical compounds in environmental media are no longer a new phenomenon that was noted in 2000 years in the past with the emergence of the oldest international contaminant, lead due to over exploitation of lead mines by way of Romans and Greeks (Sauvé and Desrosiers, 2014).The rising contaminants taht all likelihood be attributed to the "Silent Spring" the 1962 e book with the aid of Rachel Carson that encouraged the hyperlink between sizable utilization of dichlorodiphenyltrichloroethane (DDT) and environmental dangers (Carson, 2002 Sauvé and Desrosiers, 2014). Emerging contaminants andtheir destructive power, tendency to become complex, and bioaccumulation can lead to serious problem results on aquatic biota, human and animal health condition, and their surroundings for a long period of time (Barbosa et al., There are few emerging contaminants and their activity along with different adverse effect are discuss in table below,

The frequent detrimental environmental consequences of selected ECs, alongside with their conventional functions, are listed in Table 1.

Table 1
General functions and adverse environmental effects of selected ECs.

Emerging contaminants	Function	Adverse effects
Antibiotics (clarithromycin, penicillin, sulfonamides, roxithromycin, tetracycline)	Antimicrobial substances that stop infection by killing or inhibiting growth of bacteria.	Induce antibiotic resistance in microbial strains, alter microbial community structure, and cause low population of algae, bacteria, nematodes, etc.
Fragrances (galaxolide, musk xylene, musk ketone)	Used as a fragrance ingredient in a wide range of consumer products including perfumes, cosmetics, shampoos, etc.	Toxic to aquatic organisms, cause oxidation stress to gold fish, carcinogenic to rodents, may damage the human nervous system
Preservatives (methyl paraben, 2-phenoxyethanol)	Prevent microbial decomposition and used in cosmetics, toiletries, etc., as preservative ingredients.	Responsible for weak estrogenic activity
Fire retardants (polybrominated diphenyl ethers or (PBDEs))	Used as flame retardant chemicals in paints, plastics, televisions, building materials, etc., to make them difficult to burn.	Affect brain and nervous system, hormone activity, reproduction and fertility.

- The existences of these chemical compounds in environmental media are no longer a new phenomenon and can be dated again to 2000 years.
- In the past with the emergence of the oldest international contaminant, lead due to over exploitation of lead mines by way of Romans and Greeks (Sauvé and Desrosiers, 2014).
- Subsequently, the vogue regularly sweeps via the usual contaminants to the existing day nanomaterials, pharmaceuticals, non-public care products, etc.

2. METHODOLOGY

Wastewater treatment is a process used to remove all harmful contaminants from wastewater (water that has been affected by human use) and convert it into usable water with minimum impact on the environment. The following few points about the treatment of waste water is narrated below:

The treatment process takes place in a wastewater treatment plant (WWTP), often referred to as a water resource recovery facility (WRRF) or a sewage treatment plant (STP).

- Pollutants in municipal wastewater (households and small industries) are removed or broken down into non harmful elements.
- The treatment of wastewater is part of the overarching field of sanitation.
- Sanitation also includes the management of human waste and solid waste as well as storm water (drainage) management.
- By-products from wastewater treatment plants, such as screenings, grit and sewage sludge may use as manure and in other purposes

Details of waste water treatment plant and its components

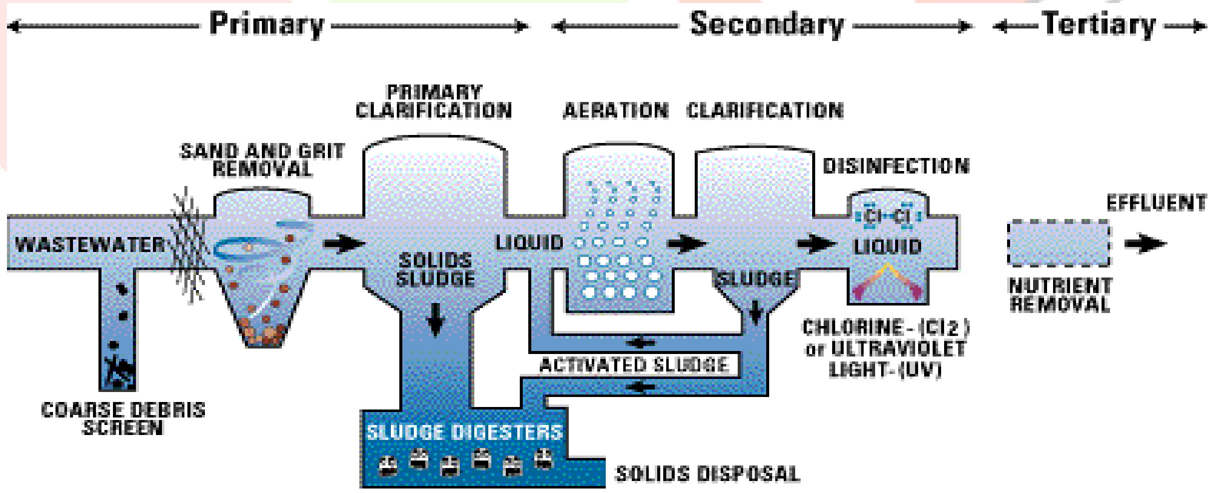

Fig.2.2 is clearly demonstrated that the different components and assembly for sewage water treatment to remove all harmful contaminants

The author conducted different study on the sewage water treatment plant in ……………. In Allahabad, detail top view of the plant as mention in the figure2,3. The different section of the plant and all parameters and discussed in the result section in this literature.

Fig.2.3 is clearly showing the top view of sewage water treatment plant atBakshiband, Daragang. Prayagraj where the parametric study of the of the water treatment has been done.

Many nations throughout the globe are planning to improve a couple of Waste Water Treatment Plants by using superior cure applied sciences to comply with ECs elimination desires to defend the surroundings (Roccaro, 2018 Pesqueira et al.,). As for example, superior oxidation approaches (AOPs) in ariation tank are the most investigated superior cure approaches for ECs elimination in the last few years, Therefore, this paper goals to find out the optimum value of different contaminants and their systematic evaluation for reuse of waste water. Some progressive organic therapy applied sciences have proven vital advantages in phrases of operational expenses and elimination efficiencies for traditional pollution such as organic matter, vitamins or solids present in the waste water.

3.Result and Discussion

The waste water contains mud, different chemicals, solid particles of varying organic and inorganic materials and large many emerging contaminants which are very much harmful for human use. Therefore, the treatment process of waste water may reduce these effects and this water can be reused for watering cleaning of rough areas. Here in the fig.3.1 clearly demonstrated that what are the harmful contaminants are generally stay in the waste water.

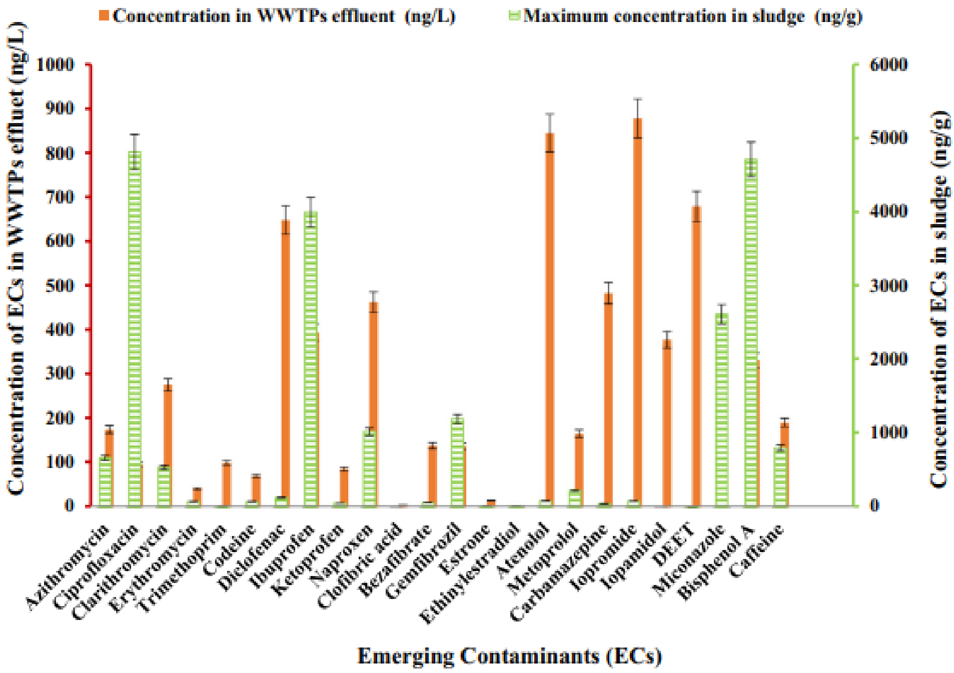

Fig.3.1 clearly demonstrated that the different harmful emerging contents and their proportionate amount (mg.) present per litre ofwater in Waste water treatment plant

.The aim of the authors to safeguard the huge amount of waste and yellow water of a day and recycle these waste water for general purpose use such as watering in the garden, Lawn and toil-let etc. The recycle treated water helps to make up the scarcity of water during peak summer in different places in India. To describe the result of different aspects of treated water here the tanks are numbered from 1, 2, 3,4 & 5 as mentioned in tables below and all these tank numbers are taken for plotting the result of contaminates/ particle in treated water.

Sl. No.	Tank of Sewage Plant	Tank Number
1	Waste water tank	1
2	Sewage Tank	2
3	Ariation Tank	3
4	Chlorine Dozing Tank	4
5	Clear water tank	5

The plot in fig.3.1 clearly demonstrated that the acidic and basic nature of water changes in different tanks in sewage water treatment process. Ph value of water in different treated tank varies from 6.2 to 8 and when it passes through the treating processes it's finally takes the value of 7, i.e. the value of normal clear water.

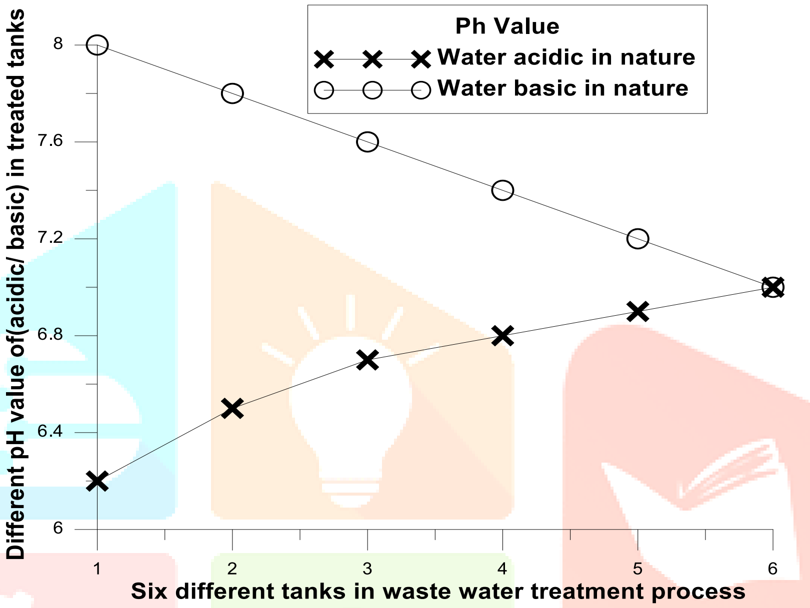

Fig.3.2 clearly demonstrated that the acidic and basic nature of water changes in different tanks in sewage water treatment process

It is also viewing that as the waste water passes from sewage tank to clear water tank through the various tank the value of Ph gradually decreases from 8 to 7 by which the basic nature of water decreases and on the other hand the same increases from 6.2 to 7 by which acidic nature minimizes.

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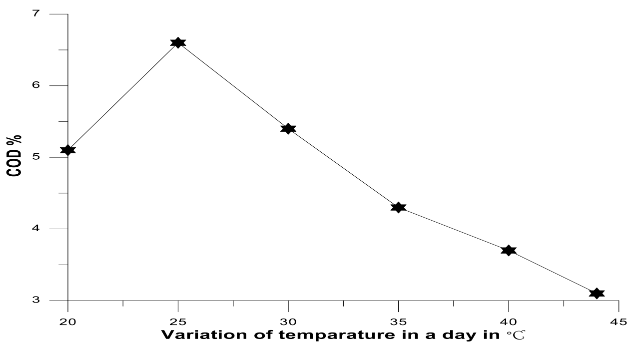

Fig.3.3 clearly demonstrated the percentage of dissolve carbon dioxide in water varies with day temperature

The above plot fig.3.3 clearly demonstrated that the percentage of dissolved CO_2in treatedwater changes in different tanks as the day temperature changes from 20^0 to 45^0 centigrade in a day. The maximum value of CO2 present in water is 6.6% at 25^0-day temperature, it may be the cause of present of geo-plankton or green microorganism those are highly stable at 25^0 centigrade and in all other cases as the day temperature falls the percentage absorption of CO2 in waterproportionally reduces.

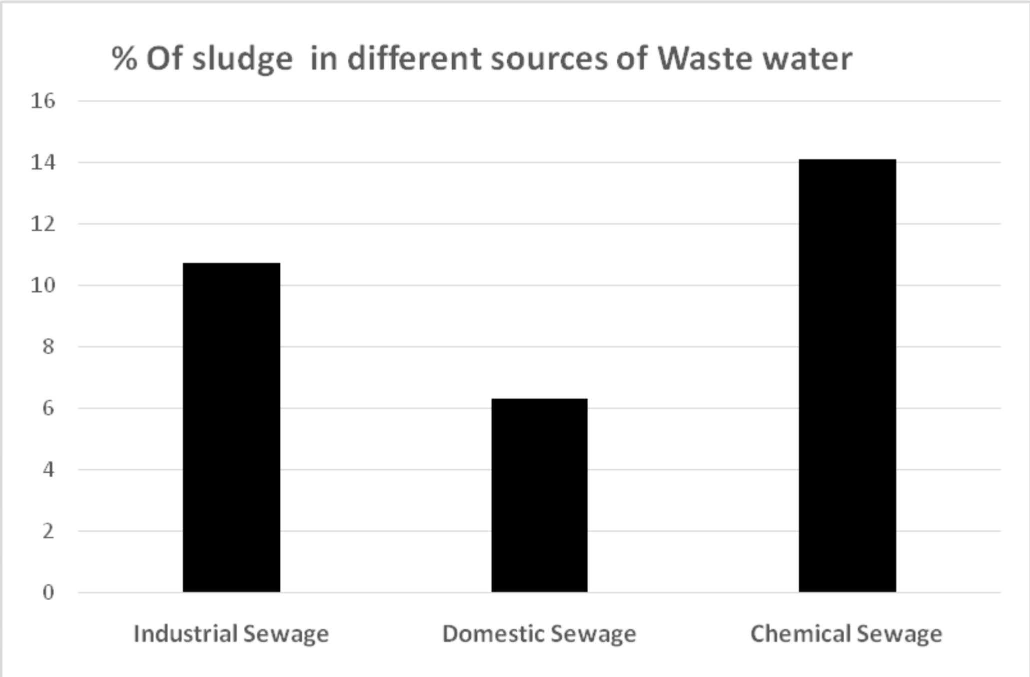

Fig.3.4 clearly confirmed that the sludge percentage varies from 6.3 to 14.1 when the water is collected in sewage tank from varying sources

When the water is collected from the different sources of waste water, **fig.**3.4 clearly confirmed that the sludge percentage in water varies from range 6.3 to 14.1. Waste water from chemical plants generate highest amount of sludge whereas the domestic waste water produces least sludge at the end of the treatment of water. This also given a clear indication that the sewage plant should be separated for domestic, industrial and chemical plant so process of waste water treatment will be easy and economical.

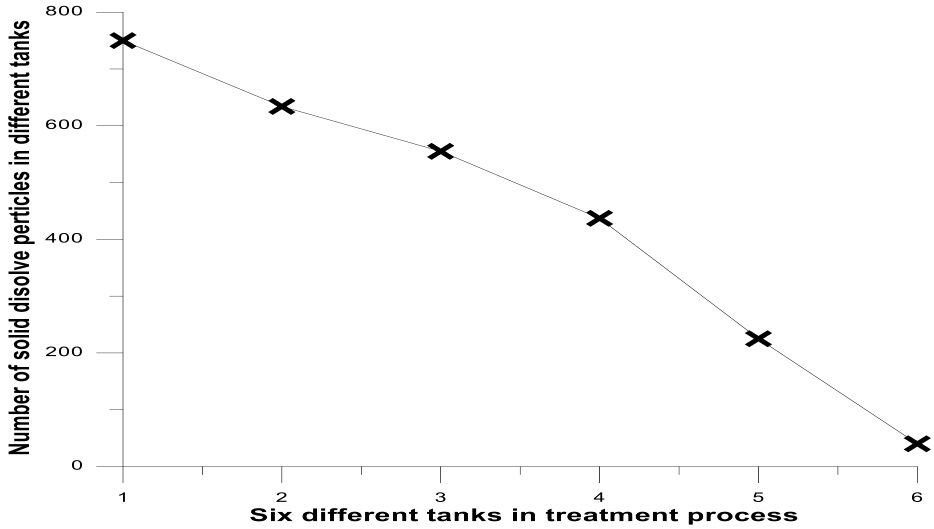

Fig.3.5 plot clearly established amount of dissolved solid particles present in different tanks in water treatment plants.

In the above plot of dissolved solid in the waste water process plant in fig.3.5 clearly mentioned the highest amount of dissolved solid particles of 750 ppl in highly contaminated water when it is collected for treatment and it is gradually reduced as the treatment process is continued and finally the value of solid dissolve particles reaches to 44 ppl in the clear water tanks in water treatment plants. The percentage reduction of solid dissolve particles is reduced to 95% observed in different treatment process.

The dissolved CO_2 in water changes in different tanks as the day temperature changes from 20^0 to 45^0 centigrade in a day. The maximum value of percentage of CO_2 present in water is 6.6% when the day temperature is recorded as 25^0, it may be the cause of present of geo-plankton or green microorganism those are highly stable at 25^0 centigrade.

4. Conclusions

Thisstudy is the combined effects of anoverview and practical approach of the classification of Emerging Contaminants in different tank of treatment process, their sources of origin, environmental occurrences, pathways of migration to distinctive environmental compartments, and unique therapy applied sciences for the elimination of ECs in WWTPs. Based on the study the following conclusions are made that are narrated below:

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- To remove the varying contaminants from waste water different processes/ treatments of chemicals are essential, in most cases lime, bleaching and chlorine powder ae mixed in different stages of treatment process despite whole ECs elimination is but to be achieved.
- Ph value of water in different treated tank varies from 6.2 to 8 and when it passes through the treating processes and finally it attends to 7, i.e. the value of normal clear water.
- It is also viewed that as the waste water passes from sewage tank to clear water tank the value of Ph gradually decreases from 8 to 7 where basic nature of water decreases and on the other hand the same increases from 6.2 to 7 by which acidic nature minimizes.
- The sludge percentage is also varying from range 6.3 to 14.1 in waste water and chemical waste water plants generate 124% more sludge than domestic waste water at the end of the treatment of water.

- The maximum value of percentage of CO_2 present in water treatment process is 6.6% at 25^0-day temperature, it may be the cause of present of geo-plankton or green microorganism those are highly stable at 25^0 centigrade.

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