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Subject

Waste water

Submitted  
by

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Submitted  
to

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Q1 ; What is wastewater Engineering?  
Describe application in safe guarding  
environment ?

Ans) Waste Water Engineering ;

Also known as sanitary engineering,  
Public health engineering, or waste water  
engineering. So basically it is the  
methods to improve sanitation of human  
communities primarily by providing the  
removal and disposal of human waste  
and in addition to the safe portable  
water.

Applications of Safe guarding Environment ;

- By disposing off treated water in order to reduce ground water contaminations and protect lakes and rivers aquatic life from contamination.
- Waste water engineering or sanitary engineering deals with management of waste water and its treatment to reuse it for various purpose.
- The recovery of sewage in effective means of saving water resources and promoting the

re-use of water resources. It is an important measure to reduce the pollution of sewage and protect Environment.

Primary objective of waste water engineering is to provide a good sanitary environmental condition in a city.

Q2;

The relation of waste water with local supply ;

Ans;

The situation where waste water flow rate data is limited or unavailable waste water flow rate estimate have to be developed from water consumption records in other information.

About 60-85% of supplied water per capita becomes waste water.

Similarly waste water generated is dependent on <sup>su</sup> applied water, as the supplied water increases the waste water is also considered to be increased.

More over the dynamics of waste water in rural areas is totally different and such waste water is free from chemical waste of industries and etc and ~~more~~ also goes directly to ground table water refined by soil and natural means to be reused.

Q3) Characteristics of <sup>waste</sup> water are included in Q4 of my paper please Note;

Q3+Q4;

Ans) Physical characteristic

1. Solids
2. Odor
3. Temperature
4. Density specific Gravity
5. Turbidity
6. Color

Settleable:- place 1-L sample in Imhoff cone and nothing volume of solids in mm that settle after 1h.

Typically 60% of suspended solids (SS) in municipal wastewater are settleable.

Total solids (TS):- obtained by evaporating wastewater sample to dryness (at ~~100~~ 105°C) and measuring mass of residue.

Total suspended solids TSS :- filtration

- step is used to separate TSS from total dissolved solids (TDS) portion of TS retained on filter (e.g. whatman, fiberglass filter - GF/C) measure after being dried at  $105^{\circ}\text{C}$
- More TSS measured as pore size of filter used is reduced.
- Important to note filter paper pore size when comparing TSS values.

Total Dissolved Solids (TDS)

Solids contained in filtrate that passes through a filter with nominal pore size of  $2\ \mu\text{m}$  or less are classified as dissolved.

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Size of colloidal particles in  
wastewater typically in range from  
0.01 - 1  $\mu\text{m}$

Volatile and Fixed Solids  
(VS and FS)

Material ~~burned~~ off when ignited/  
heated at  $550 \pm 50^\circ\text{C}$  classified  
as volatile solids (VS); In general  
VS are organic matter

Residue that remains after sample  
is ignited. VS are organic matter.

TS, TSS, and TDS comprised of  
both VS and FS.

Ratio of VS to FS used to character  
ized wastewater ~~with~~ with respect  
of amount of organic matter present.

## Odor

Odor:- is produced by gas production due to the decomposition of organic matter or by substances added to the wastewater.

Detection of Odor:- Odor is measured by special instrument such as the portable H<sub>2</sub>S meter which is used for measuring the concentration of hydrogen sulfide.

## Temperature

Temperature of wastewater is commonly higher than that of water supply.

Depending of the geographic location of mean annual temperature varies is the range of 10 to 21 °C with an average of 16 °C.



## Importance of Temperature

- a) Affects chemical reactions during the wastewater treatment process.
- b) Affects of aquatic life (fish ...)
- c) Oxygen solubility is less in warm water than cold water.
- d) Optimum temperature for bacterial activity is in the range of 25 to 35 °C.
- e) Aerobic digestion and nitrification stop when temperature rises to 50 °C.
- f) when the temperature drop to 15 °C producing bacteria become inactive.
- g) Nitrifying bacteria stop activity at 5 °C.

## Density and specific Gravity

Density:- Mass per unit volume expressed as g/L or  $\text{kg m}^{-3}$ ; density of domestic wastewater is the same as that of ~~fresh~~ water at the same temperature.

specific Gravity:- Ratio of density of wastewater to density of water  
$$SG = \frac{\text{density of wastewater}}{\text{Density of water}}$$

Both density and specific gravity are temperature dependent and will vary with concentration of TSS.

# Turbidity

Turbidity:- is the measurement of light transmitting properties of water used to indicate quality of waste discharges and natural waters with respect to the colloidal and residual suspended matter.

Measurement based on comparison of intensity of light scattered by a sample to the light scattered by reference standard.

Results of turbidity reported as nephelometric turbidity units (NTU)

## Color

color :- color is an indication of the age of wastewaters.

Fresh wastewater is light brownish-grey color.

As ~~travel~~ time in a collection system increases, and more anaerobic conditions develop, wastewater color changes sequentially from grey to dark grey and ultimately to black.

Black color of wastewater refers to septic condition.

Chemical characteristics of sewage  
PH value:- is an indicator of the acidity or the alkalinity of sewage. If the PH value is less than 7, the sewage is acidic and if PH value is more than 7, the sewage is alkaline.

Determination of PH is important because efficiency of certain treatment methods depend on it. Specially the biological treatment, for better results of PH of sewage should be around 7.0 as microorganisms can flourish in that PH range.

Fresh sewage is generally alkaline, but the passage of time PH tends to fall due to production of acid of bacterial action is an aerobic or nitrification process.

- Organic Matter (OM)
- Nitrogen Contents
- Chlorides Contents
- Fats, Oils and Greases
- Toxins
- Sulfides, Sulphates and Hydrogen<sup>s</sup> Gas
- Dissolved Oxygen (DO)

## Biological characteristics of wastewater

**Bacteria:** - Bacteria are spherical, rod, spiral and filamentous shape. Some important Bacteria are:

1. **Pseudomonas:** - Reduce  $\text{NO}_3$  and  $\text{NO}_2$ ; so it is very important in biological nitrate removal in treatment works.
2. **Bacillus:** - Destroy pathogens in biological treatment.

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Acinetobacter:- store large amount of under aerobic conditions and release it under an anaerobic condition so, they are useful in phosphate removal.

Nitrobacter:- Transform  $\text{NO}_2^-$  to  $\text{NO}_3^-$

coliform bacteria:- The most common type is E-coli *Escherichia coli*, (indicator for the presence of pathogens)

Biological characteristics of waste water:

2. Fungi; Important in decomposing organic matter to simple forms.
3. Algae; useful in oxidation ponds for treatment of wastewater (positive effect)  
Cause taste and problem when decayed, (negative effects)  
Cause eutrophication phenomena (negative effects)

#### 4. Protozoa;

feed on bacteria so they help in the purification of treated waste water.

Some of them are pathogenic.

#### 5. Viruses;

Viruses are a major hazard to public health. They cause lots of dangerous diseases.



Q5 ;

Ans) ~~Advantages~~ <sup>Types</sup> of sewerage system ;

Mainly there are two or three types of sewerage systems ;

- Combined and separate system ;

Both systems have their own traits, merits and demerits which makes them.

- Advantages of separate sewerage system ;

- Lesser in size,
- Sewers are smaller in sections for ventilation,
- Rain water and other precipitations can be reused / recycled without any treatment.

- Disadvantages of separate sewerage system ;

- Difficult to clean,
- Likely to get choked,
- Initial cost is high,
- Maintenance cost is very high.

- Advantages of Combined sewerage system ;

- Construction cost is low,
- Strength of domestic sewerage system is reduced because dilution of storm water.

- In towns with narrow streets, this system

## Disadvantages of Combine Sewage ;

- Initial cost is high.
- their handling and maintenance cost is high.
- The load on the treatment plant increases and ultimately ~~more~~ treatment cost increases.
- Some conditions sewerage may overflow and create unhygienic conditions.
- If whole sewage is to be disposed off by pumping it is uneconomical.