Assignment/ Quiz: Wastewater Engineering

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Section B

Answer No.1

Wastewater Engineering:

Definition:

Sanitary engineering, also known as public health engineering or wastewater engineering, is the application of engineering methods to improve sanitation of human communities, primarily by providing the removal and disposal of human waste, and in addition to the supply of safe potable water.

- Wastewater, also known as sewage is the liquid wastes originates from household wastes, human and animal wastes, industrial wastewaters, storm runoff, inflow and infiltration.

Applications in Safeguarding the Environment:

Sewerage system in a city is provided for safe disposal of wastewater. For this purposes sewer lines are used, it also prevent flooding of the area following a rainfall. The main purpose of sewerage system are as;

i: To provide a good sanitary environmental condition in a city

ii. Thus sanitary Engineering aims at the creation of such conditions of living which will not result into serious outbreak of epidemic (wahbai merz)diseases in a community

iii. The disposal of human excreta to a safe place by a safe and protective means

iv. To dispose of all liquid wastes from a community to a proper place for preventing a favorable

Condition for mosquito, flies breeding or bacteria growing

v. To treat the sewage so as not to endanger the water bodies, or land to get polluted where it is finally disposed of

vi. Proper disposal method should be adopted to protect sub soil water from contamination.

vii. **Reclamation and utilization of sewage**: The recovery of sewage is an effective means of saving water resources and promoting the reuse of water resources. It is also an important measure to reduce the pollution of sewage and protect the environment. However, the recovery and treatment of sewage

must be treated with caution and prevent the expansion of water pollution caused by personnel problems and technical problems and the re-use of non-compliance.

viii. Recycling of solid waste: In addition to the above-mentioned sewage treatment, another difficulty in the process of urbanization is the solid waste that urban residence form and discharge in production and life. This is an important bi-product of urban life and production, if according to their nature, they can be divided in two categories i-e Recyclable and non-recyclable.

ix. Application of energy saving and emission reduction technology: As one of the key elements of eco city construction, the key of energy saving and emission reduction technology is to control, detect and minimize the carbon dioxide emission and energy use of the target city, so as to support the construction quality and efficiency of the ecological city.

Answer No. 2

Relationship between wastewater generation and water supply:

Average daily per capita consumption varies from 130 to 200 Liters. Local use depends on:

1) Size of the city:

Small communities tend to have more limited use of water. Unsewered homes have less use of water usually less than 40L/cap/day. Cities having water using industries may result in high per capita use, thus wastewater generation increases.

2) Industry and Commerce:

Effect of industry has to be studied for individual type of industry. The industrial use has an indirect relation with the population. Also industries use auxiliary water supplies for some purposes. Wastewater obtained from this area is highly contaminated and require special treatment.

3) Commercial:

Commercial consumption largely depends upon the number of people employed in the business district. Uses of water in commerce are for sanitary and air conditioning etc. The typical commercial consumption taken is 10 to 15 L/m^2 of the floor area or 95 L/m^2 of the ground area. This wastewater is easy to treat and therefore economical.

4) Characteristics of population:

Economic level of the population determines the use of water which usually ranges from 50 to 380 liter/capita/day. In the slum districts it usually varies from 50 to 100 Liter/Capita/day. The quantity of wastewater is directly proportional to the characteristic of population.

5) Metering:

Metering of water supplies to the individual users has been shown to reduce the consumption substantially. As the consumer has to pay in proportion to the quantity of water consumed.

6) Quality of Water:

Water which is of poor quality will be used less than the water which is satisfactory to consumer.

7) Pressure:

High pressure maintained in the system results in greater use, In addition it increases losses in the leaks.

8) Maintenance:

A well designed program of maintenance will reduce loss and waste in the system. (Detection of leaks, presence of unauthorized connection from survey.)

Answer No. 3

Importance of wastewater characterization:

A characterization of the wastewater, which provides a wide variety of information regarding the type and concentration of the contaminants present, must be carried out to determine the type of contamination concerned.

FOOD AND BEVERAGE INDUSTRIES WASTEWATER

A major concern is that groundwater is susceptible to pollutants from residential and commercial sources. Therefore, food and beverage industry generated wastewater discharged to the subsurface in must provide reasonable assurance of meeting groundwater quality standards. Due to the variability in contaminant concentrations in wastewater across the food and beverage sector, facility-specific and possibly production-specific characterization of wastewater plays a significant role in treatment determinations and design. Setting effluent limitations based on dispersal area soils, flow analyses, and depth to groundwater can strengthen efforts to ensure that drinking water sources and the environment is protected for future generations.

Miso Production Facility

Miso is a fermented bean paste food product typically made from soybeans or other legumes. It is used as a seasoning and is high in protein. Miso is produced by cooking soybeans and then combining the cooked beans with a mold that is cultivated on rice (koji) and salt. The combined ingredients are fermented over time to produce a thick paste. Wastewater generated by miso production can contained high concentrations of organic constituents. Miso production wastewater treatment conducted examined treatment of constituents such as COD, BOD, suspended solids, phosphorus, and nitrogen. Concentrations of COD ranged from as low as 840 mg/L to as high as 15,000 mg/L and BOD average results of 5210+260 mg/L.

Answer No. 4

Physical Chemical and Biological characteristic of waste water

Physical characteristic of waste water

Turbidity

Color

Odor

Total solids

Temperature

Chemical characteristic of waste water

Chemical oxygen demand

Nitrogen

Chlorides

Sulfates

Alkalinity

PH

Heavy metals

Trace elements

Priority pollutants

Biological characteristic of waste water

Biological oxygen Demand

Oxygen required for nitrification

Microbial population

Answer No. 5

Advantages and Disadvantages of separate and Combine sewerage system

Combined System

Separate System

1. Combined Sewerage System

In a combined system, the same sewer is intended to carry both the domestic sewage, industrial wastes as well as the surface and the storm water flow.

Advantages

Rainwater keeps sewage fresh making it easier and more economical for treatment purpose.

Dilution also helps, this being in itself a method of treatment.

Automatic flushing is provided by water.

This is the simplest method of collection and house plumbing economies.

Disadvantages

The bigger size of the sewer would involve larger excavation.

Overflowing under worst conditions may endanger public health.

Cost of pumping and treatment would increase due to the large quantity of sewage to be handled.

The dry weather flow is a small amount of the total flow, the large size of the sewer would often result in causing silting up due to low velocity of flow during the dry period of the year.

2. Separate System

In a separate system, the domestic sewage and industrial wastes are carried in one set of sewers whereas the storm and surface water are carried in another set of sewer.

Advantages

Being smaller in size, the sewers are economical. The surface water may be taken in open or closed conduit or drains at or near the surface and discharged at suitable outlets, thus greatly simplifying the design of sewers of storm water drains.

There is no risk of stream pollution as no storm overflows are to be provided.

The quantity of sewage to be treated is small, the disposal or the treatment works can be economically designed.

If the pumping of sewage at the treatment works is necessary, pumping cost would be much less as there is no need to pump the storm water.

Disadvantages

Unless laid at a steep gradient, self-cleaning velocity in the sewer cannot be assured and flushing shall have to be done. This may prove unsatisfactory and expensive.

Risk of encroachment by unauthorized rainwater collection and consequent overflows of sewage maybe there.

Double house plumbing is another disadvantage. Two sewers or drains in a street leading to greater obstruction of traffic which repairs to any one of them are being carried out.

Maintenance costs of two systems are greater than that for one.