Internal Assesment Test -III–Jan-2022

Sub:	Municipal and Industrial Waste Water Engineering					Sub Code:	17CV71	Branch:	CIVIL
Date:	24/01/ 2022	Duration:	90 min's	Max Marks:	50	Sem/Sec:	V11		OBE

Answer All Questions

		MARKS	CO	RBT
1	Write a note on volume reduction, strength reduction, neutralization, equalization, and proportioning	[10]	CO4	L2
2	What are the merits and demerits of municipal and industrial waste water combined treatment methods	[10]	CO4	L2
3	Explain the differences between domestic waste water and industrial waste water in detail	[10]	CO4	L2
4	Explain with flow diagram, treatment options for sugar mills	[10]	CO5	L2
5	Explain with help of flow chart, along with sources and characteristics of waste water from cotton textile mill	[10]	CO5	L2

1. Volume reduction

In general the first step in minimizing the effects of industrial wastes on relieving streams and treatment plants is to reduce the volume of such wastes. This may be accomplished by

1. Classification of wastes
2. Conservation of waste water
3. Change in production to decrease wastes.
4. Re- using both industrial & municipal effluent as raw water supplies.
5. Elimination of Batch or Slug Discharge of Process Wastes

Strength Reduction

Waste Strength reduction is the second major objective for an industrial plant concerned with waste treatment. The strength of wastes may be reduced by

1. Process Changes
2. Equipment Modifications
3. Segregation of Wastes
4. Equalization of Wastes
5. By-Product Recovery
6. Proportioning of Waste sand
7. Monitoring Waste Streams

Neutralization

Excessively acidic or alkaline wastes should not be discharged without treatment into a receiving stream. A stream is adversely affected by low or high pH values. This adverse condition is even more critical when sudden sludge of acids or alkalis are imposed upon the stream.

Acceptable Methods of Neutralization

1. Mixing wastes so that the net effect is a neutral pH.
2. Passing acid wastes through beds of limestone.
3. Mixing acid wastes with lime slurries.
4. Adding the proper proportions of concentrated solutions of caustic soda (NaOH) or soda ash (Na_2CO_3) to acid wastes.
5. Adding compressed CO_2 to alkaline wastes.
6. Adding sulphuric acid to alkaline wastes.

The material and method used should be selected on the basis of the overall cost, since material costs vary widely and equipment for utilizing various agents will differ with the method selected. The volume, kind and quality of acid or alkali to be neutralized are also factors in deciding which neutralizing agent to use.

Equalization

Equalization is a method of retaining wastes in a basin so that the effluent discharged is fairly uniform in its characteristics (pH, color, turbidity, alkalinity, B.O.D etc). A secondary but significant effect is that of lowering the concentration of effluent contaminants. A retention pond serves to level out the effects of peak loadings on the plant while substantially lowering the BOD and suspended solids load to the aeration unit. Air is sometimes injected into these basins to provide:

1. Better mixing
2. Chemical oxidation of reduced compounds
3. Some degree of biological oxidation
4. Agitation to prevent suspended solids from settling.

2. Combined treatment methods:

Merits:

✓ Here the responsibility is placed with one owner, while at the same time, the cooperative spirit between industry & municipality increases, particularly if the division of costs is mutually satisfactory.

✓ Only one chief operator is required, whose sole obligation is the management of the treatment plant i.e he is not burden by the miscellaneous duties often given to the industrial employee in charge of waste disposal & the chances of mismanagement and neglect which may result if industrial production men operate waste treatment plants, are eliminated.

✓ Since the operator of such a large treatment plant usually receives higher pay than separate domestic plant operators, better trained people are available.

✓ Even if identical equipment is required construction costs are less for a single plant than for 2 or more. Furthermore, municipalities can apply for state & or federal aid for plant construction, which private industry is not eligible to receive.

✓ The land required for plant construction & for disposal of waste products is obtained more easily by the municipality.

✓ Operating costs are lower, since more waste is treated at a lower rate per unit of volume.

✓ Possible cost advantages resulting from lower municipal financing cost & federal grants.

✓ Some wastes may add valuable nutrient for biological activity to counter act other industrial wastes that are nutrient deficient. Thus bacteria in the sewage are added to organic industrial wastes as seeding material. These micro organisms are vital to biological treatment. Also, acids from one industry may help to neutralization alkaline wastes from another industry.

✓ The treatment of all waste water generated in the community in a municipal plant, enables the municipality to assure a uniform level of treatment to all the users of theriver & even to increase the degree of treatment given to all waste water to the maximum level obtainable with technological advance.

Demerits:

✓ If an industrial waste water stream is discharged to municipal waste treatment system which has to been designed to handle it, the discharge may cause serious problem. It could disrupt the treatment processes affecting the performance and hence the treated effluent characteristics.

✓ The seriousness of the effect will depend on the characteristics of industrial waste streams, the size and design of municipal waste treatment system and standards for discharge recycle or reuse.

✓ Waste characteristics such as temperature, pH, organic content, toxicity and flow must be evaluated to determine the acceptability to municipal waste treatment system otherwise it will cause serious problems.

✓ Among many problems arising from combined treatment the most important is the character of the industrial waste water reaching the disposal plant.

✓ Because most sewage plants use some form of biological treatment, it is essential for satisfactory operation

- ✓ As homogenous in composition and uniform in flow rate as possible and free from sudden dumping of the more deleterious industrial wastes
- ✓ Not highly loaded with suspended matter
- ✓ Free of excessive acidity or alkalinity and not high in content of chemicals that precipitate on neutralization or oxidation
- ✓ Practically free of antiseptic materials and toxic trace metals
- ✓ Low in potential sources of high BOD, such as carbohydrates, sugar, starch and cellulose
- ✓ Low in oil and grease content.

3. Difference between Domestic and Industrial wastewater

Domestic sewage consists of liquid waste originating from bathrooms, water closets, kitchen sinks, wash basins etc of residential, commercial or institutions buildings. For example, apartments, hotels, hospitals, shopping mall etc

Industrial wastewater consists of wastes originating from the industrial processes of various industries such as paper manufacture, textile, sugar, brewing, dyeing etc. The quality of industrial wastewater depends largely upon the type of industry & the chemicals used in their process water. Sometimes, they may be very foul & may require extensive treatment before being disposed off in public sewage

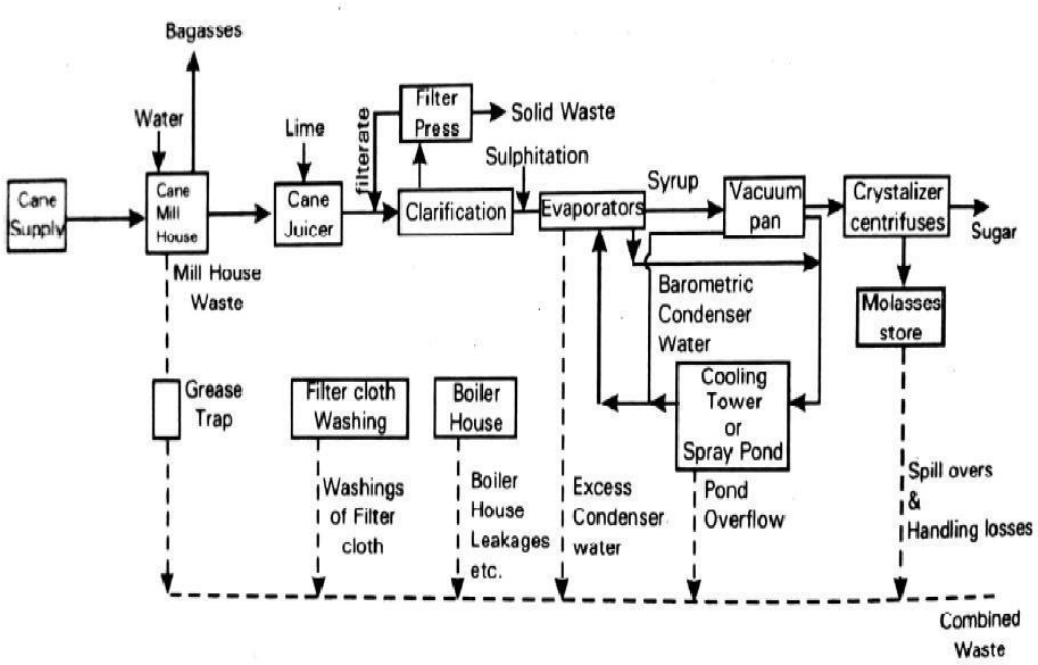
Industrial waster as pointed out above, usually contains several chemical pollutants & toxic substances in too large proportions. The characteristics of the produced wastewater will usually vary from industry to industry & also vary from process to process even in the same industry, such industrial waster cannot always be treated easily by the normal methods of treating domestic wastewater & certain specially designed methods are sequence of methods may be necessary. The normal biological treatment methods for sewage are dependent up on the bacterial activity within the sewage, & as the toxic chemicals present in the industrial wastewater may hinder or destroy the bacterial activity. Therefore these normal methods may not be sufficient unless modify &/or supplemented by additional techniques.

4. The sugar cane is normally harvested manually in India, which eliminates the carriage of soil & trashes to the factory along with the sugar canes. The sugarcanes are cut into pieces & crushed in a series of rollers to extract the juice in the mill. Then for sugar canes of Lime is then added to the juice & heated where in all the colloidal & suspended impurities are coagulated. Much of the color is also removed during lime treatment. The coagulated juice is then clarified to remove the sludge. The clarifier sludge is further filtered through filter process & then disposed off as solution waste. The filtrate is recycled to the process and the entire quantity of clarified juice is treated by passing sulfur dioxide gas through it. The process is known as sulphitate process. Here color of the juice is completely bleached out due to this process.

The clarified juice is then pre- heated & concentrated in evaporators & vacuum pans. The partially crystallized syrup from the vacuum pan is known as Massecuite is then transferred to the crystallizers,

where complete crystallization of sugar occurs. The massecuite is then centrifuged, to separate the sugar crystals from the mother liquor. The spent liquor is discarded as black strap molasses. The sugar is then dried & bagged for transport.

The fibrous residue of the mill house known as bagasses may be burnt in the boilers or may be used as raw materials for the production of paper product. The black strap molasses may be used in the distilleries.

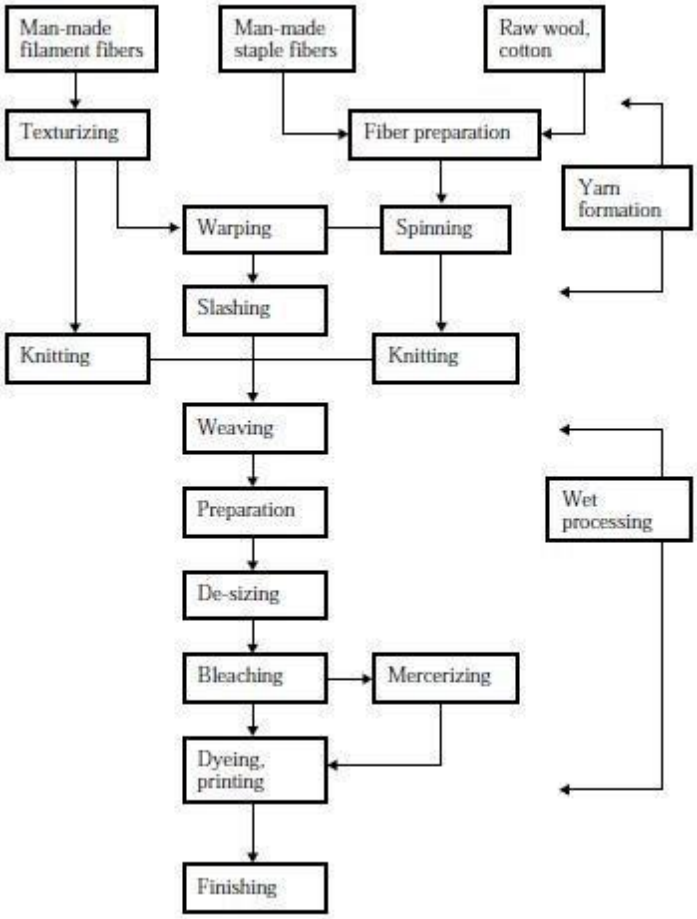


5. Cotton and Textile Industry Manufacturing process

An integrated cotton textile mill produces its own yarn from the raw cotton. Production of yarn from raw cotton includes steps like opening & cleaning picking, carding, and drawing spinning, winding & warping. All these sequences are dry operations and as such do not contribute to the liquid waste of the mill. The entire liquid waste from the textile mills comes from the following operation of slashing (sizing), scouring, desizing, bleaching, mercerzing, dyeing & finishing.

In slashing the yarn is strengthen by loading it with starch or other substances wastes originates from the sections due to spills & floor washings. The substitution of low BOD sizes (such as carboxy methyl cellulose) for the high BOD of the mill effluent by 40 to 90%. After slashing, the yarn goes for weaving. The prepared cloth now requires scouring & desizing to remove natural impurities and the slashing compounds. Enzymes are usually used in India to hydrolyze the starch, acids may also be used for the is purpose. Caustic soda, soda ash, detergents etc. are also used in this section. Bleaching operations use oxidizing chemicals like peroxides & hyper chloride to remove natural coloring material. The section contributes about 10% of the total pollution load.

Mercerzing consists of passing the sloth through 20% caustic soda solution. This process includes the strength elasticity luster & dye affinity. Waste from this section is recycled after sodium hydroxide recovery. Negligible waste which may come out of this section contributes little BOD but a high degree of alkalinity.


Man-made filament fibers
Man-made staple fibers
Raw wool, cotton
Texturizing
Fiber preparation
Yarn formation
Warping
Spinning
Slashing
Knitting
Knitting
Weaving
Preparation
Wet processing
De-sizing
Bleaching
Mercerizing
Dyeing, printing
Finishing