WASTE VOLUME REDUCTION

INTRODUCTION

- In general, the first step in minimizing the effects of industrial wastes on receiving streams and treatment plants is to reduce the volume of such wastes.

❖ **This may be accomplished by:**

1. Classifying wastes;
2. Conserving wastewater;
3. Changing production to decrease wastes
4. Reusing both (industrial and municipal effluents as raw water supplies
5. Eliminating batch or slug discharges of process wastes.

1. CLASSIFICATION OF WASTES

❖ If wastes are classified so that manufacturing-process waters are separated from cooling waters, the volume of water requiring intensive treatment may be reduced considerably.

- Sometimes it is possible to classify and separate the process waters themselves so that only the most polluted ones are treated and the relatively uncontaminated ones are discharged without treatment.
- The main classes of wastes are as follows:
  I. Wastes from manufacturing processes
  II. Waters used as cooling agents in industrial processes
  III. Wastes from sanitary uses:

(A). WASTES FROM MANUFACTURING PROCESSES

- These include waters used in

i. forming paper on traveling wire machines,

ii. those expended from plating solutions in metal fabrication, and

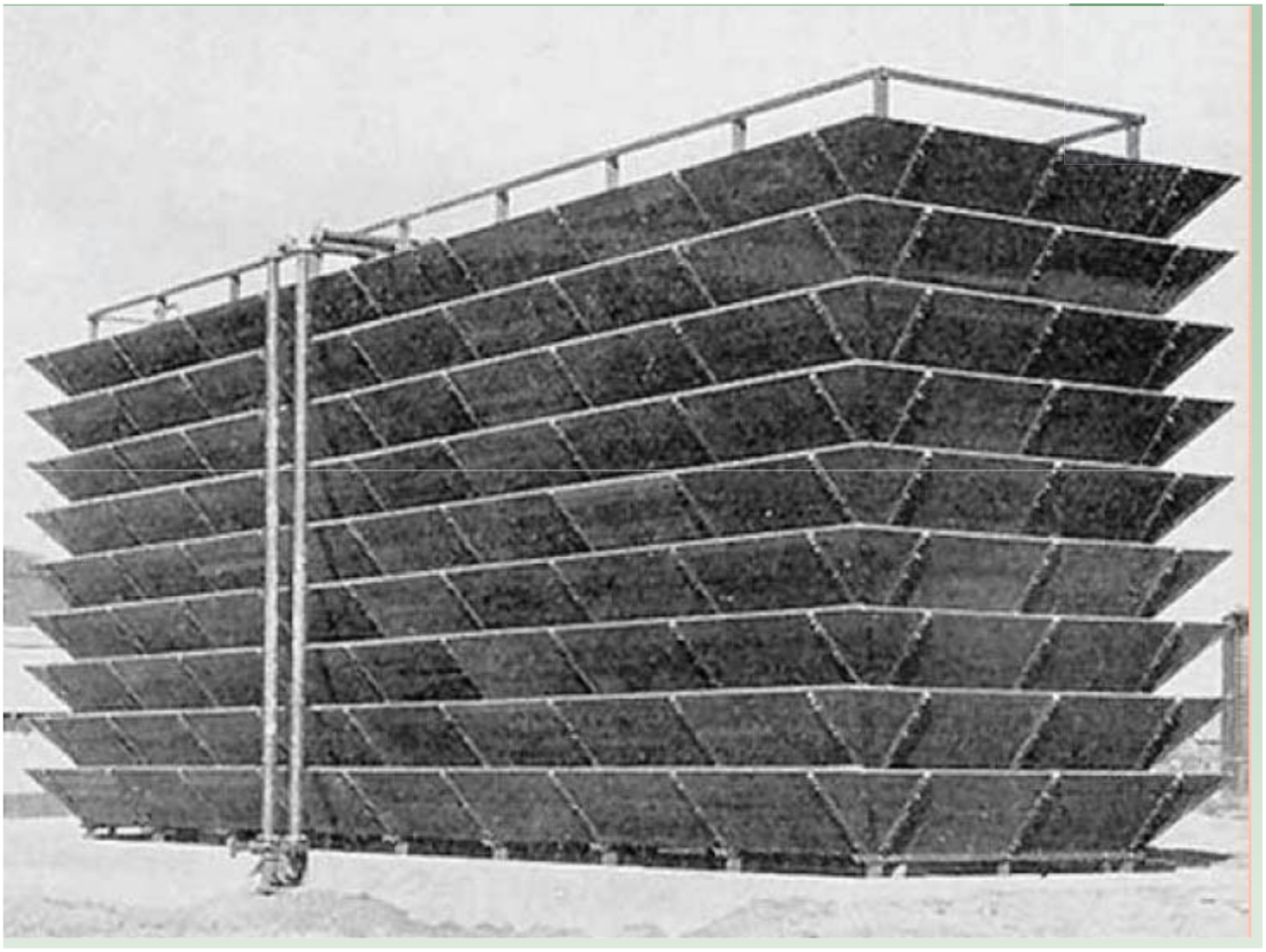
iii. those discharged from washing of milk cans in dairy plants,

iv. dyeing and washing of textile fabrics, and;

v. washing of picked fruits from canneries.

(B). WATERS USED AS COOLING AGENTS IN INDUSTRIAL PROCESSES:

- The volume of these wastes varies from one industry to another.
- Cooling waters have been found to be **contaminated by small leaks, corrosion products, or the effect of heat**; however, these wastes usually contain little, if any, process matter and are generally considered nonpollutional.



- Power plants, however, represent an industry in which cooling waters are segregated and account for a high percentage of total volume of plant wastes, and may contain hazardous contaminants under infrequent malfunctioning conditions.

POWER PLANT

(C). WASTES FROM SANITARY USES:

- These will normally range from 90 to 180 lit (25 to 50 gallons) per employee per day.
- The volume depends on many factors,

1. Including size of the plant,
2. Amount of waste-product materials washed from floors, and
3. The degree of cleanliness required of workers in the process operation.

2. CONSERVATION OF WASTEWATER

- **Water conservation is waste saved.** Conservation begins when an industry changes from an “open” to a “closed” system.
- Example:- A paper mill that recycles white water (i.e., water passing through a wire screen upon which paper is formed) and thus reduces the volume of wash waters it uses is practicing water conservation.

- Concentrated recycled wastewaters are often treated at the end of their period of usefulness, because usually it is impractical and uneconomical to treat the wastewaters as they complete each cycle.
- The savings are twofold: Water costs and waste-treatment costs are lower.

- However, many changes to effect conservation are quite costly and their benefits must be balanced against the costs.
- If the net result is deemed economical, then new conservation practices can be installed with assurance.

- E.g. :- Steel mills reuse cooling waters to quench ingots, and coal processors reuse water to remove dirt and other noncombustible materials from coal.
- In materials science, **quenching** is the rapid cooling of a work piece to obtain certain material properties.

3. CHANGING PRODUCTION TO DECREASE WASTES

- Changing production to decrease wastes is an effective method of controlling the volume of wastes but is difficult to put into practice.
- It is hard to convince plant managers to change their operations just to eliminate wastes.
- Normally, the operational phase of engineering is planned by the chemical, mechanical, or industrial engineer whose primary objective is cost savings.

- The main considerations of the environmental engineer, on the other hand, include the protection of public health and the conservation of a natural resource.
- Yet, there is no reason that both objectives cannot be achieved.

- The engineer can also mention that balancing the quantities of acids and alkalis used in a plant often results in a neutral waste, along with saving chemicals, money, and time spent in waste treatment.

- Several measures that can be used to
- reduce wastes:

1. **Improved process control,**
2. **Improved equipment design,**
3. **Use of different or higher quality raw materials,**
4. **Good housekeeping, and**
5. **Preventative maintenance.**

4. REUSING BOTH INDUSTRIAL AND MUNICIPALEFFLUENTS FOR RAW WATER SUPPLIES

- **Practiced mainly in areas where water is scarce or expensive**, reusing industrial and municipal effluents for raw water supplies is proving a popular and economical method of conservation; of all sources of water available to industry, sewage plant effluent is the most reliable at all seasons of the year and the only one source that is actually increasing in quantity and improving in quality.

- Although there are many problems involved in reusing effluents for raw water supply, it must be remembered that *any water supply* poses problems to cities and industries.
- The problems of reusing sewage effluents are similar to those of reusing industrial effluents.
- The greatest manufacturing use of water is for cooling purposes.

- Because the volume of this water requirement is usually great, industries located in areas where water is expensive should consider reusing effluents.
- Even if the industry is fortunate enough to have a treated municipal water supply, the cost will usually be excessive in comparison, which may have a generally beneficial effect.

- Reusing municipal and industrial effluents saves water and brings revenue into the city.
- The design of wastewater-treatment plants will be greatly influenced because the effluent must satisfy not only conventional stream requirements (stream standards) but also those effluent standards.

5. ELIMINATION OF BATCH OR SLUG DISCHARGES OF PROCESS WASTES

- In “wet” manufacturing of a product, one or more steps are sometimes repeated, which results in production of a significantly higher volume and strength of waste during that period.
- If this waste is discharged in a short period, it is usually referred to as a *slug discharge.*

- *This type of waste, because of its concentrated contaminants and/or surge in* volume, can be troublesome to both treatment plants and receiving streams.
- There are at least two methods of reducing the effects of these discharges:
- (1) the manufacturing firm can alter its practice to increase the frequency and lessen the magnitude of batch dischargers; and

- (2) slug waste can be retained in holding basins from which they are allowed to flow continuously and uniformly over an extended (usually 24-hour) period. These are called ***proportioning and equalization*** *(of slug wastes)*

- **THEORY QUESTIONS**
- Q1. Explain various methods of waste volume reduction. *(May 2010, 8 marks)*
- Q2. Write about 'Classification of industrial waste' for waste volume reduction.