

WATER SOURCES

Water is the most abundant compound in nature. It covers 75% of the earth surface. About 97.3% of water is contained in the great oceans that are saline and 2.14% is held in icecaps glaciers in the poles, which are also not useful. Barely the remaining 0.56% found on earth is in useful form for general livelihood. **The main sources of water are:**

1. Rain water

2. Surface water (fresh – salt) (Rivers – Lakes – Seas – Oceans)

All the sources of water can be broadly divided into

1. Surfaces sources and
2. Sub surface sources

The surface sources further divided into :(i. Streams; ii. Rivers; iii. Ponds; iv. Lakes; v. Impounding reservoirs, etc).

STREAMS AND RIVERS

Rivers and streams are the main source of surface source of water. But some rivers dry up wholly or partially in summer. So they require special arrangements to meet the water demand during hot weather. Mostly all the cities are situated near the rivers discharge their used water of sewage in the rivers; therefore much care should be taken while drawing water from the river.

IMPOUNDING RESERVOIRS

In some rivers the flow becomes very small and cannot meet the requirements of hot weather. In such cases, the water can be stored by constructing a bund, a weir or a dam across the river at such places where minimum area of land is submerged in the water and max. quantity of water to be stored. In lakes and reservoirs, suspended impurities settle down in the bottom, but in their beds algae, weeds, vegetable and organic growth takes place which produce bad smell, taste and colour in water. Therefore this water should be used after purification. When water is stored for long time in reservoirs it should be aerated and chlorinated to kill the microscopic organisms which are born in water.

3. SUBSURFACE SOURCES “Ground water” (fresh – salt) (Wells)

These are further divided into

- (i) Infiltration galleries
- (ii) Infiltration wells
- (iii) Springs

WELLS:

A well is defined as an artificial hole or pit made in the ground for the purpose of tapping water.

The three factors which form the basis of theory of wells are

1. Geological conditions of the earth’s surface
2. Porosity of various layers
3. Quantity of water, which is absorbed and stored in different layers.

The following are different types of wells

1. Shallow wells
2. Deep wells
3. Tube wells
4. Artesian wells

WATER QUALITY

Absolutely pure water is never found in nature and contains number of impurities in varying amounts. The rainwater which is originally pure also absorbs various gases, dust and other impurities while falling. This water when moves on the ground further carries salt, organic and inorganic impurities. So this water before supplying to the public should be treated and purified for the safety of public health, economy and protection of various industrial process, it is most essential for the water work engineer to thoroughly check analyse and do the treatment of the raw water obtained the sources, before its distribution. The water supplied to the public should be strictly according to the standards laid down from time to time.

Proposes of studying water quality:

1. Determine the degree of pollution.
2. Determine of design steps for water treatment process, (drinking water – industrial water – swimming ponds).
3. Assessment of treatment units.
4. Check the effluent of WTP with environmental.

Quality of raw water depends on:

- 1- Suspended solids.
- 2- Organic matter.
- 3- Dissolved solids.
- 4- Microorganisms.
- 5- Bacteria (pathogenic).
- 6- Algae.

Physical characteristics of water:

- 1- Temperature.
- 2- Odor, taste, color.
- 3- Turbidity < 5 NTU (nephelometric instrument).
- 4- Total dissolved solids 500 – 1000 mg/l.
- 5- Clarity. (Potable, palatable).

Chemical characteristics of water:

- 1- pH 6.5 – 8.5.
- 2- Iron \leq 0.3 mg/l.
- 3- Manganese \leq 0.1 mg/l.
- 4- Hardness. ($\text{CaCO}_3 > 150$ mg/l)
- 5- Fluoride 0.5 – 1.5 mg/l.
- 6- Nitrate \leq 45 mg/l.

Biological characteristics of water:

Fecal coli forms, total coli forms, E.coli.

The existence of any E. coli bacteria indicates a recent contamination of water.

Properties of an ideal indicator:

1. Applicable for all types of water.
2. Always present when pathogens are present.
3. Non-pathogen for the lab. Personal.
4. Have a longer survival time outside the human body (24 hrs)

Water Pollution

Pollution Source

1. Wastewater discharge
2. Solid waste and its leakage
3. Acid rain
4. particle Settlement in air
5. Polluted Runoff with fertilizer and ;
6. others

Classification of Water Pollutants

A) Classified according to the nature of its origin:

- ❖ Point source: effluents from a pipe, channel, or any other confined and localized source
- ❖ Dispersed (nonpoint) source : broad, unconfined area from which pollutants enter a body of water/not at only one particular point
- ❖ Surface runoff from agricultural areas
- ❖ Acidic runoff from mining areas is a dispersed pollutant
- ❖ Storm water drainage systems in towns and cities

B) Classified on their environmental or health effects

- ❖ Domestic sewage: *pathogenic organism, oxygen-demanding substances, plant nutrients*---conventional sewage treatment processes+advanced sewage treatment
- ❖ Agriculture pesticide, industrial activity: *Toxic organic and inorganic chemicals*--- proper management of toxic and other hazardous wastes
- ❖ *Sediment*: smothers benthic and disrupts the reproductive cycles of fish and other life forms---sedimentation
- ❖ Oil
- ❖ Heat (thermal pollution)
- ❖ Radioactive substances

Thermal Pollution

Thermal pollution: Thermal enrichment cause: mainly from cooling water in power plants---increase by up to 15°C

Control: cooling pond or cooling tower

Heat: dissipated into the air

Water: discharged to the water or reuse as cooling water