WATER QUALITY PARAMETERS

Water is the important compound for the existence of human beings, animals and plants. Water is used for agricultural, industrial and domestic purposes. About 80 % of the earth's surface is occupied by water. Even though there is huge amount of water resources, available source of fresh water of good quality is limited, the minerals present in the top soil are dissolved by rain water, and this water enters into water bodies and gets polluted. This is because almost all the compounds are dissolved in water.

In industries water is used as a heat transfer fluids in heat exchange systems, the generation of steams in boilers, solvent in chemical industries, processing and washing liquid in paper and textile industries. Water is also needed to support the needs of both agriculture and wetlands. Water is vital for domestic purposes such as drinking. Preparing, food, bathing, washing cloths and dishes etc

SOURCES OF WATER

The two main sources of water are as follows:

a) Surface Water

i) Rain Water is the purest form of water. It is obtained by the evaporation of surface water. But, when it reaches earth's surface through atmosphere, it dissolves considerable amount of industrial gases (like CO_2, SO_2, NO_2, etc.) and suspended solid particles.

ii) River Water consists of rain and springs water. Water from these sources flow over the surface of land and dissolves the soluble minerals present in the soil. River water contains the minerals of soil (such as chlorides, sulphates, bicarbonates of sodium, calcium, magnesium and iron) and some organic matters.

iii) Lake Water contains less amount of dissolved minerals, but the quantity of organic matter is very high.

iv) Sea Water is the highest impure form of water. Major source of sea water is river water which consists of dissolved and suspended impurities. Due to continuous evaporation, the sea water becomes more saline.

b)Underground Water Underground water is clear in appearance due to filtering action of the soil. A part of rain water percolates into the earth and dissolves the soluble salts present in the soil. So, the underground water contains higher dissolved salts.

Examples: Springs water and wells water. We know that, surface and underground water is used for domestic and industrial purposes. So, the water should be free from unwanted impurities and harmful bacteria.

TYPES OF IMPURITIES IN WATER

The impurities present in the water are broadly classified into three types which are as follows:

Physical Impurities

Physical impurities are classified into two types: a) Suspended Impurities: They are sand, oil droplets, vegetable and animal matters which cause turbidity in water.

Colloidal Impurities:

They are finely divided silica, clay and organic waste products which impart colour, odour and taste to water.

Chemical Impurities

Chemical impurities are classified into two types.

a) Dissolved Salts : They are bicarbonates, sulphates and chlorides of Ca and Mg, carbonates and bicarbonates of Na and K. Dissolved magnesium and calcium salts in water cause 'hardness' whereas alkali salts (bicarbonate and carbonates of potassium and sodium, bicarbonate of calcium and magnesium) makes the water "alkaline".

b) Dissolved Gases: They are O_2, CO_2, H_2S, SO_2, NO_2, CO, etc., which makes the water acidic. So, they accelerate the rate of corrosion.

Biological Impurities

They are fungi, bacteria and other microorganisms which spread harmful diseases.

WATER QUALITY PARAMETERS

Chlorides

Chlorides are present in all water sources.

Source of chlorine is from mineral deposits,domestic wastewater discharges, industrial wastewaters,Irrigation drainage,Human excreta (urine) contains chloride

Significance:

- Undesirable taste
- Contributes to hardness
- In industrial waters: deposits, boiler corrosion
- An increase above the normal chloride level is an index of pollution by domestic wastewaters.

Iron

- From soil, rock and plant matter
- From pipes; from coagulants

Significance:

- Stains plumbing fixtures and clothes
- Growth of iron bacteria in pipe lines (red water complaints)
- Corrosion of pipe lines – taste and odor problems

Sulphates

Occurs in water from

- Solvent action of water on gypsum and other salts
- Decomposition of organic matter
- Industrial wastewaters – atmospheric SO_2 (acid rain)

Significance:

- Laxative effects
- Tastes
- Scales in boilers – hardness

Total Dissolved Solids (TDS)

TDS represents mainly inorganic substances

Principal constituents are: bicarbonates, chlorides and sulfates of Ca, Mg, and Na. There is generally an increase of hardness with TDS.

Significance:

- Taste
- Laxative effects
- Indication of hardness
- Waters with high TDS not desirable for industries

Nitrogen

Nitrogen is important to all life. Nitrogen in the atmosphere or in the soil can go through many complex chemical and biological changes.Nitrogen occurs in natural waters in various forms, including nitrate, or NO_3, nitrite, or NO_2, and ammonia, or NH_3. Nitrate is the most common form tested. Ammonia is the least stable form of nitrogen and thus difficult to measure accurately. Nitrite is less stable and usually present in much lower amounts than nitrate.

These three compounds are interrelated through the process of nitrification, the biological oxidation of ammonia to nitrate. In this process nitrite is produced as an intermediate product.

Order of decreasing oxidation state:

Nitrate → Nitrite → Ammonia → Organic Nitrogen

(stable) (Unstable)

The water used for domestic and industrial purpose should be free from toxic substances and pathogenic bacteria.

Dissolved Oxygen

Surface waters of good quality should be saturated with dissolved oxygen.The optimum dissolved oxygen in natural water is 4-6 ppm which is essential for supporting aquatic life.A fall in dissolved oxygen level indicates that a water body is polluted with organic matter.The basic winkle's method is used to determine the dissolved oxygen.