Chemical precipitation of textile effluents

Lecture-27
Role of complexing agent

Heavy metals are removed from the aqueous waste streams by precipitation in various forms such as carbonates, hydroxides, sulphides at different pH values.

The presence of other metals and complexing agents such as ammonia, citric acid, EDTA affects the solubility of these heavy metals hydroxides and determines residual concentration values after treatment.
Removal of undesired pollutants

Textile industry effluent may require specific treatment for the removal of undesired pollutants based on its end use. For instance, manganese and iron salts are deterrents in textile processing. Iron and manganese are expected to be present in effluent which may be due to source of water supply, dyes stuff, chemicals etc.
The textile industry are required to provided aeration system at equalization tanks or holding tank prior to RO system. Iron in the form of ferrous bicarbonate may be removed by aeration when ferric hydroxide is precipitated and carbon dioxide is released into atmosphere.
Role of lime

Aeration also helps to raise pH by reducing the content of dissolved carbon dioxide.

Manganese bicarbonate also react in the same way for which pH of more then 10 is achieved by addition of lime in physico-chemical treatment plant.

If ferrous sulphate is present in waste water, the insoluble hydroxide of iron or manganese may be formed due to addition of lime.

The iron precipitation will occur at 8.5 pH, but the manganese will be precipitated at pH of 9.0 is reached.
Iron removal

• The iron removal filter can be provided prior to RO to further reduce iron and manganese content.

• In the filter, manganese zeolite is formed by treating sodium zeolite with manganous sulphate, and then oxidizing by treatment with potassium permanganate.

• Higher insoluble oxides of manganese are formed on the surface of zeolite grains, thereby making available oxygen capable of converting the ferrous and manganous ions in water to insoluble oxidized form which can be filtered out using multi-grade filter column.
Ion exchange resins

Ion exchange process is normally used for the removal of inorganic salts and some specific organic anionic components such as phenol.

All salts are composed of a positive ion of a base and a negative ion of an acid. Ion exchange materials are capable of exchanging soluble ions and cations with electrolyte solutions.

For example, a cation exchanger in the sodium form when contacted with a solution of calcium chloride, will scavenge the calcium ions from the solution and replace them with sodium ions.

This provides a convenient method for removing the hardness from water or effluent.
Ion exchange resins

Ion exchange resin are available in several types starting from natural zeolite to synthetics which may be phenolic, sulphonic styrenes and other complex compounds.

The divalent ions such as calcium and magnesium in general have high affinity for the ion exchange resins and as such can be removed with high efficiencies.

In the ion exchange process the impurities from the effluent streams is transformed into another one of relatively more concentrated with increased quantity of impurities because of the addition of regeneration chemicals.

The process can not be used for removal of non-ionic compounds.