Technique to Stabilize Inorganic and Colloidal Particle Present in Raw Water

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Abstract— Techniques and various kinds of methods are been used for stabilizing the contents like mineral are and other organic compound which are present in the water are to be removed thought process which are been per performed. Raw water which is also a pure form of water needs to be stabilized through which it is been made safe for components

Key words: Stabilize Inorganic, Colloidal Particle, Raw Water

I. INTRODUCTION

Until 1970 underground water was the main source of water for both drinking and irrigation purposes. As a result almost all aquifers were seriously depleted form overpumping with the coastal aquifers suffering from sea intrusion.

The increase of population as well as the increase in the tourist and industrial activities have led to an increase in the demand for water and have created an acute shortage of potable water.

The relevant Authorities, identified the water shortage problem in time and in consultation with international Organisations, prepared a long term plan for solving the problem.

Convincing evidence of the great significance which was given and continues to be given to the rational exploitation of the water resources is the present storage capacity of the dams and ponds etc.

II. RAW WATER

Raw water is natural water found in the environment and has not been treated, nor have and minerals, ions, particles or living organisms been removed. Raw water includes rainwater, ground water, water from infiltration wells, and water from bodies like lakes and rivers. Without treatment, raw water can be used for farming, construction or cleaning purpose.

1) Farmers use it for watering their crops or give to livestock to drink, storing it in manmade lakes of reservoirs for long periods of time. Contraction industries can use raw water for making cement of for damping down unsealed roads to prevent dust rising.

A. What's included in a basic raw water treatment system?

As mentioned above, the exact components of a raw water treatment system depend on the quality of water being drawn from in relation to the quality of water needed. But in general, a basic raw water treatment system typically includes some type of:

- Chemical feed to help facilitate the flocculation or coagulation of any suspended solids.
- Clarfier to settle out the larger solids.
- Filtration to remove the smaller particles.

III. WATER TREATMENT PLANTS

A. General Principles Treatment Stages

Water treatment plants surface water from the dams. Raw water contains suspended and inorganic material, plant material, bacteria, protozoa, algae, gases etc. In order to remove all those foreign particles form the water and make the water suitable for drinking purposes the following procedures should be carried out

- Removal of superadded matter.
- Decolourisation and oxidization of the inorganic material and killing of all pathogenic micro-organisms by adding chlorine (prechlorination)
- Aeration of water.

1) Removal of suspended mater

Suspended matter present in the water like leaves, water plants, soil etc. is retained at the raw reservoir of the treatment plant.

2) Prechlorination

Chlorine has oxidizing and disinfecting properties. With the addition of chlorine the various organic and inorganic materials like iron, hydrogen supplied etc. are oxidized and

all the pathogenic and other micro-organisms are killed or inactivated. Chlorine is present at all stages of water treatment in order ensure that there is no development of pathogenic micro-organisms.

3) Flocculation

a) Addition of aluminilum Sulphate

The mixture of aluminium sulphate is necessary in order to remove the organic particles present in the raw water and to change the colour of the water from green to clear, the aluminium sulphate Acts the colloidal particles of the water and flocs are formed. As these flocs are heavier than the water molecules, they gradually settle down to the bottom of the reservoir as sludge.

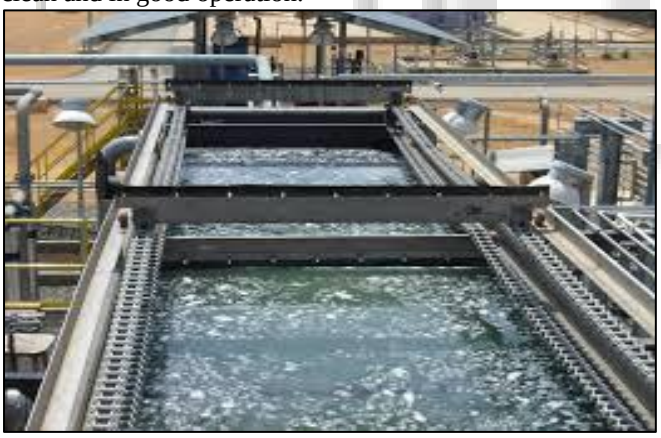
4) Sedimentation

After the addition of aluminium sulphate and polyelectrolyte the flocs down, as studge, in the sedimentation lanks. The sedimentation tanks are sometimes called clarfiers because here. The water is being clarified. The removed of sludge is done on a dally basis and the sludge is transferred to the sludge drying beds, while the water is transferred to the filters.

5) Filtering

After the sedimentation tanks, the water passes through special rapid sand filters where it is filtered in order to remove all the remaining flocs/ particles which are present in the water.

The filters are washed at regular time intervals, by flashing water in the opposite direction, in order to keep clean and in good operation.



6) Addition of time

In Lime add to the water to correct its acidity (pH). The addition of lime is done, only when considered necessary, usually during the winter months. The processes of lime addition.

The raw water coming from the dams of Cyprus is alkaline (pH) 8.0-8.5 but after the addition of aluminium sulphate and cholorine it becomes more and (pH 7.0-7.5).

7) Postchirorination

After the water treatment process is comleted, chorine is again add in the water to ensure that there is no growth of any pathogenic micro-organisms in the water supplied to the water boards etc.

a) Coagulation (water treatment)

In water treatment, congulation is a process that occurs when a coagulant is added to water to "destabilize" colloidal suspensions Conversely. Flocculation involves the addition of polymers that clump the small, destabilized particles together into larger aggregates so that they can be more easily separated from the water. Coagulation is a chemical process that involves neutralization of charge whereas flocculation is a physical process can be used as a preliminary or intermediary step between other water or waste waste treatement processes like filtration and sedimentation. Iron and aluminium salts are the zirconium have been found to be highly effective as well

- Factors
- Mechanism
- Determining Coagulant Dose

IV. TERSEPHANOU WATER TREATMENT PLANT

Tersephanou Water Treatment Plant has been in operation since October 1999. The nominal capacity of the Plant is 60 000 cubic metres per day with provision for extension for extension to 90 000 cubic metres per day. The Plants treats raw water from the Kouris and Kalavasos dams through the Southern Conveyor pipeline. Desalinated water from the dhekelia Desalination Plant can also be conveyed to Nicosia through the Tersephanou pumping station and the Tersephnou-Nicosia conveyor. Tersephanou Water Treatment Plant Supplies water to the cities of Nicosia, Lamaca and Famagusta.

A. Technical Characteristics

- Aeration tank.
- 3 sedimentation tanks withs a storage capacity of 375 m^3 and 833m^3/h capacity.
- 8 filters of 400 m^3/h capacity.
- 16 000 m^3 treated water reservoir.

V. SELF-CONTAINED WATER TREATMENT UNITS

For the supply of additional water to the Athienou area, two self-contained water treatment units have been installed in 1996 with a nominal capacity of 250 cubic metres per day each. Units operate only during the period April to October.

VI. DESALINATION SYSTEMS

A. General Principles and Treatment Stages

Desalination systems have the ability to remove salts from sea water and produce fresh potable water. The major desalting processes are:

1) Thermal Distillation Processes
- Multi-stage Flash Distillation.
- Multiple Effect Distillation.
- Vapour Compression Distillation
- Solar Distillation.

2) Membrane processes
- Electrodialysis
- Reverse Osmosis:

1) With energy recovery.
2) Without energy recovery.

In themal distillation processes saline water is heated to boiling point producing vapour, which is condensed, to form fresh water. For these processes, thermal energy is required, which can be produced by conventional or by renewable sources, such as solar energy, in membrane sources, such as solar energy. In membrane processes, electricity is required, either for water compression, (70-80 atmospheres) or for ionization of the sea water salts.

B. Reverse Osmosis Process

Reverse osmosis is a membrane separation process in which water from a pressurized saline solution is separated from the solutes by flowing through a membrane. For this separation no heating or phase change is necessary. The major energy required for desalting is for pressurizing the feedwater of the membranes.

The basic stages of treating sea water in a reverse osmosis system are the following.
- Pretreatment
- Reverse Osmosis
- Posttreatment

1) Preteatment

In reverse osmosis systems pretreatment of sea water is very important for the membranes. Therefore. In pretreatment stage micro-organisms must be destrotyed and suspended solids must be removed so that micro-organism growth and salt precipitation does not occur on the membranes. Usully pretreatment of saline water consists of:
- Prechlorination of sea water
- Coagulation of colloid particles
- Fine filtration
- Acid addition (pH correction and inhbit Precipitation)

2) Reverse Osmosis

At this stage, high pressure pums supply the pressure needed to enable the water to pass through the membranes and reject the salts. This pressure ranges from 54 to 80 atmospheres. As a portion of the water passes through the membranes. In the remaining feedwater salt content increases. At the same time a portion of this feedwater is discharged without passing through the membranes. Without this controlled discharge, the pressurized water would continue to increases in salt concentration creating such problems as precipitation of supersaturated salts and increased osmotic pressure across the membranes. The amount of the feedwater discharged to waste is between 20 and 70 percent of feed flow and depends on the salt content of the feedwater.

3) Posttreatment

At the stage of posttreatment, water is stabillsed and prepared for distribution

This stage might consist of:
- Removal of gases, such as hydrogen sulphide.
- Adjustment of pH and hardness.

