

PURIFICATION OF WATER BY HOT METAL METHOD: An Approach

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ABSTRACT

Drinking water is essential for the survival of all mankind. Many resources of water are available on Earth but very few of them can be used for the purpose of drinking. The water contained around the most of villages and cities is contaminated, therefore cannot be directly used for drinking due to the presence of Bacteria, fungi, virus etc. e.g. During the last decades Shimla city suffered from jaundice. About 30-40 of people died within 3months due to the presence of bacteria in drinking water and this bacteria spread around the whole city by drinking water supply. Therefore, water must be purified before drinking. There are many methods for purifying water but only few of them are used. One of them, "Water humidification and dehumidification" is explained here.

Keywords-*Humidification, Dehumidification, Contaminated.*

Introduction

Drinking water is essential for the survival of mankind. Water is available in many resources around us like rivers, lakes, ponds etc. but this water is not suitable for drinking purpose due to the presence of contaminants in it. Every year around 560 peoples die in India due to water pollution. So water must be purified to have a healthy life of mankind [01]. So researchers are working on different methods for purifying the water.

Treatment for drinking water production involves the removal of contaminants from raw water to produce water that is pure enough for human consumption without any short term or long term risk of any adverse health effect. Substances that are removed during the process of drinking water treatment include suspended solids [02], bacteria [03], algae, viruses, fungi, and minerals such as iron [04] and manganese. The processes involved in removing the contaminants include physical processes such as settling and filtration, chemical processes such as disinfection and coagulation and biological processes[05] .Measures taken to ensure water quality not only relate

to the treatment of the water, but to its conveyance and distribution after treatment. It is therefore common practice to have residual disinfectants in the treated water in order to kill any bacteriological contamination during distribution [06].

World Health Organization (WHO) guidelines are a general set of standards intended to be applied where better local standards are not implemented. More rigorous standards apply across Europe, the USA and in most other developed countries [07].

Methodology

Water Treatment Process: A combination selected from the following processes is used for municipal drinking water treatment worldwide:

- Pre-chlorination for algae control and arresting biological growth [08]
- Aeration along with pre-chlorination for removal of dissolved iron and manganese
- Coagulation for flocculation or slow-sand filtration
- Coagulant aids, also known as polyelectrolytes to improve coagulation and for thicker floc formation
- Sedimentation for solids separation, that is removal of suspended solids trapped in the floc
- Boiling and distillation.
- Filtration to remove particles from water
- Disinfection for killing bacteria viruses and other pathogens.
- RO and UV process [09]

Humidification and Dehumidification: Addition of moisture to the air without change in its dry bulb temperature is known as humidification. And removal of moisture from air without changing its dry bulb temperature is known as dehumidification. [10]

Equipment Used

Pump: The pump we have used in this process is simple aquarium pump which has an electric motor. The input to the pump is 220-240 V and gives an output of 10W at 50Hz. [11]

The pump needs to be dipped in water. As switch is turned on, small motor runs. A motor is connected to a small rotary vane which produces suction and pressurizes the water to outlet simultaneously.

Condenser: Condenser is a type of heat exchanger which is used to cool down the steam into water. [12]. The type of condenser is used of CP pipes which are made of brass having silver coating. Aluminum plates are connected to pipes to give it larger heat transfer rate. The condenser which I have made is cross flow type. The cold water coming from the pump flows through pipes and steam condenses through aluminum plates connected to pipe.

Hot Metallic Plate: Hot metallic plate is a cast of molten aluminum which when cooled is treated with a non-stick polytetrafluoro-ethylene (PTFE) material which has the melting point of 500K and thermal conductivity of .25W/mK.

It is connected to a thermo coil which heats the metallic plate to required temperature of 383K-400K. Water coming from condenser is sprinkled on hot metallic plate which converts into steam. The small unwanted particles of water settle down while steam moves to condenser for condensation.

Pipes: The pipes which I have used in the process are domestic PVC pipes. The diameters of pipes used are 2cm and .5cm. Polyvinylchloride also known as poly vinyl or vinyl.[13]

Container: There has a small container where water after condensation in condenser gets accumulated. A small tap is joined to the container for drinkable water outlet.

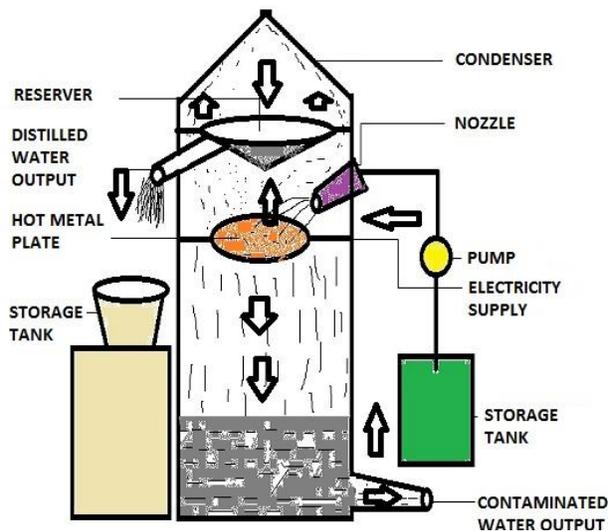


Fig.01 Water Purification process

Working Procedure

First there will be a storage tank which will store the unpurified water and then pump to be used. The pump will increase the pressure of unpurified water, there will be a nozzle and this nozzle will be connected with the outlet pipe of the pump and then the nozzle will spray water by using high pressure and throughout on the hot metallic plate and then the plate needs to supply of 220v-230v, then the plate will be hot and the water will make of vapor and this vapor will go through up of the column and the polluting particles will fall down to the hot metallic plate. When the vapor reached at the condenser then the vapor will transfer the heat and vapor will be cold and make the dropped water. Below the condenser there is a reservoir tank which will collect the dropped water and this purified water will go through out by using the outlet pipe from the reservoir tank and then collect the purified water. This is the process to purify the unpurified water by using the hot metallic plate. The purified water is used now for drinking purpose.

Conclusion

It is found that various methods are developed for distillation of water. These methods are subject to the demand of fresh water, quality of water source and the involved expense.

-Humidification, dehumidification process is the most appropriate option for fresh water production by using hot metallic plate and combined system for simultaneously hot water production.

-This process are suitable for the water supply industry.

-The contaminated water is purified 800L/Hours.

-Solids, bacteria, algae, viruses, fungi, and minerals such as iron and manganese will be reduces.

- The maximum height up to which it can generate its maximum efficiency is 1m.

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