© 2018 IJSRSET | Volume 4 | Issue 7 | Print ISSN: 2395-1990 | Online ISSN : 2394-4099
Themed Section : Engineering and Technology

Solar Water Purifier

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ABSTRACT

A parabolic trough is a type of solar thermal collector that is straight in one dimension (Z-axis) and curved as a parabola in the other two (X and Y-axis), lined with a polished mirror like finish metal. The energy of sunlight which enters the collector parallel to its plane of symmetry is focused along the focal line where the vacuum tube is placed. The vacuum that surrounds the outside of the tube greatly reduces convection and conduction heat loss, therefore achieving greater efficiency than flat-plate collectors. A sedimentation tank allows suspended particles to settle out of water or wastewater as it flows slowly through the tank, thereby providing some degree of purification. Carbon filters are very effective at removing chlorine, benzene, radon, solvents trihalomethane compounds, volatile organic chemicals such as pesticides and herbicides and hundreds of other man-made chemicals that may come into contact with tap water as it proceeds through the system. In addition chlorine is added with the help of salt tank & filters remove bad tastes and odours from the water. After this filtration by carbon filter, water is then passed to evacuated vacuum tubes for remaining purification.

I. INTRODUCTION

Water purification is the process of removing undesirable chemicals, biological contaminants, suspended solids and gases from contaminated water. The goal is to produce water fit for a specific purpose. Most water is purified for human consumption (drinking water), but water purification may also be designed for a variety of other purposes, including meeting the requirements of medical, pharmacological, chemical and industrial applications. In general, the methods used include physical processes such as filtration, sedimentation and distillation, biological processes such as slow sand filters or biologically active carbon, chemical processes such as flocculation and chlorination and the use of electromagnetic radiation such as ultraviolet light.

The purification process of water may reduce the concentration of particulate matter including suspended particles, parasites, bacteria, algae, viruses, fungi; and a range of dissolved and particulate material derived from the surfaces that water may have made contact with after falling as rain. The standards for drinking water quality are typically set by governments or by international standards.5-9 These standards will typically set minimum and maximum concentrations of contaminants for the use that is to be made of the water. It is not possible to tell whether water is of an appropriate quality by visual examination. Simple procedures such as boiling or the use of a household activated carbon filter are not sufficient for treating all the possible contaminants that may be present in water from an unknown source.

II. LITERATURE REVIEW

In this system we use the copper tube to transfer the water from one tank to other tank and to heat the water with the help of solar energy by sun rays because the copper has high thermal conductivity of 385 w/mk.

Copper tube is popular for heating systems in both new and remodelled buildings. Contractors have learned through experience that, all factors considered, copper tube remains superior to any substitute material. The advantages of light weight, choice of tempers, long-term reliability, and ease of joining, bending and handling are of major importance. For example, where rigidity and appearance are factors, drawn tube is recommended. Annealed tube is particularly suitable for panel heating, snow melting, and short runs to radiators, convectors and the like. With annealed tube the need for fittings is reduced to a minimum, saving substantial installation labour and material.

Copper is an excellent electrical conductor. Most of its uses are based on this property or the fact that it is also a good thermal conductor. However, many of its applications also rely on one or more of its other properties. For example, it wouldn't make very good water and gas pipes if it were highly reactive. On this page, we look at these other properties:

Corrosion resistant

Copper is low in the reactivity series. This means that it doesn't tend to corrode. Again, this is important for its use for pipes, electrical cables, saucepans and radiators. However, it also means that it is well suited to decorative use. Jewellery, statues and parts of buildings can be made from copper, brass or bronze and remain attractive for thousands of years.

Easily joined

Copper can be joined easily by soldering or brazing. This is useful for pipework and for making sealed copper vessels.

Ductile

Copper is a ductile metal. This means that it can easily be shaped into pipes and drawn into wires.

Copper pipes are lightweight because they can have thin walls. They don't corrode and they can be bent to fit around corners. The pipes can be joined by soldering and they are safe in fires because they don't burn or support combustion.

Parabolic collector

Parabolic trough system work on the principle of line focus, mobile receiver. Parabolic trough systems consist of parallel rows of mirrors (reflectors) curved in one dimension to focus the sun's rays. The mirror arrays can be more than 100 m long with the curved surface 5 m to 6 m across. Pipes (absorber tubes) with a selective coating serve as the heat collectors. The coating is designed to allow pipes to absorb high levels of solar radiation while emitting very little infra-red radiation. The pipes are insulated in an evacuated glass envelope. The reflectors and the absorber tubes move in tandem with the sun as it crosses the sky. This system is useful for electricity generation, manufacturing of solar fuels, water purification etc.

All parabolic trough plants currently in commercial operation rely on synthetic oil as the fluid that transfers heat (the heat transfer fluid) from collector pipes to heat exchangers, where water is preheated, evaporated and then superheated. The superheated steam runs a turbine, which drives a generator to produce electricity. After being cooled and condensed, the water returns to the heat exchangers. Parabolic troughs are the most mature of the CSP technologies and form the bulk of current commercial plants. Most existing plants, however, have little or no thermal storage and rely on combustible fuel as a backup to firm capacity.

Aluminum composite plate was mounted on the supporting structure of the concentrator by bending method. The stainless chrome plate is covered on the composite plate by bolting from suitable points without any bending process. Thus a high accurate surface was obtained without causing any reflection loss.

Sedimentation tank

Sedimentation is a physical water treatment process using gravity to remove suspended solids from water. Solid particles entrained by the turbulence of moving

water may be removed naturally by sedimentation in the still water of lakes and oceans. Settling basins are ponds constructed for the purpose of removing entrained solids by sedimentation .Clarifiers are tanks built with mechanical means for continuous removal of solids being deposited by sedimentation.

Basic

Suspended solids (or SS), is the mass of dry solids retained by a filter of a given porosity related to the volume of the water sample. This includes particles of a size not lower than 10 μm. Colloids are particles of a size between 0.001 μm and 1 μm depending on the method of quantification. Because of Brownian motion and electrostatic forces balancing the gravity, they are not likely to settle naturally.

The limit sedimentation velocity of a particle is its theoretical descending speed in clear and still water. In settling process theory, a particle will settle only if;

1. In a vertical ascending flow, the ascending water velocity is lower than the limit sedimentation velocity.
2. In a longitudinal flow, the ratio of the length of the tank to the height of the tank is higher than the ratio of the water velocity to the limit sedimentation velocity.

Removal of suspended particles by sedimentation depends upon the size and specific gravity of those particles. Suspended solids retained on a filter may remain in suspension if their specific gravity is similar to water while very dense particles passing through the filter may settle. Settleable solids are measured as the visible volume accumulated at the bottom of an Imhoff cone after water has settled for one hour. Gravitational theory is employed, alongside the derivation from Newton's second law and the Navier–Stokes equations.

Stokes law explains the relationship between the settling rate and the particle diameter. Under specific conditions, the particle settling rate is directly proportional to the square of particle diameter and inversely proportional to liquid viscosity.

The settling velocity, defined as the residence time taken for the particles to settle in the tank, enables the calculation of tank volume. Precise design and operation of a sedimentation tank is of high importance in order to keep the amount of sediment entering the diversion system to a minimum threshold by maintaining the transport system and stream stability to remove the sediment diverted from the system. This is achieved by reducing stream velocity as low as possible for the longest period of time possible. This is feasible by widening the approach channel and lowering its floor to reduce flow velocity thus allowing sediment to settle out of suspension due to gravity. The settling behavior of heavier particulates is also affected by the turbulence.

Final filtrations process act on the filter. Filtrations is any of various mechanical, physical or biological operation that separate solid from fluid by adding a medium through which only the fluid can pass the fluid that passes through is called the filtrate. In any physical filter over size solids in the fluid are retained and in biological filters particulates are trapped and ingested and metabolites are retained and removed however the separation is not complete; solids will not be contaminated with some fluid and filtrate will contain fine particles.

There are many water filtration products in existence today. However, none of these products fully satisfy the needs of families in rural areas with a lack of clean drinking water. All of the following products require either large sums of money or extensive maintenance, and some products don't even come with a guarantee of potable water. The aim of our project is to purify water by using solar panel and parabolic collector which produces electricity and heat. We are using solar energy because in rural areas the amount of electricity is not sufficient. Sun ray is available in our country and by using this sun ray, we will produce electricity.

III. SUMMARY

Although there are many technologies for water purification, then where the actual problem is arising.

For people concerned about the quality of their municipally-supplied drinking water and unhappy with other methods of additional purification available to them, solar purification of tap water or brackish groundwater can be a pleasant, energy-efficient option.

IV. CONCLUSION

To achieve this goal, a system was designed incorporating a parabolic solar trough coupled with a custom designed distillation device. The incoming solar radiation from the sun is focused and concentrated onto a receiver pipe using a parabolic trough, heating the incoming impure water, at which point it is sprayed into our custom designed distillation device where it evaporates and is re-condensed into pure potable water.

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