STUDY OF INSTANT WATER HEATING TAP

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ABSTRACT

A growing demand for emerging alternative energy technologies is fuelled by rising energy prices and decreasing energy supplies. Domestic predicament heating is an industry that continues to profit from increased research in and improvement of solar technology. Thus our project is the summary of overall water tap heater which makes use of heating coil and thermostat. This way the overall study outlines the implementation of an electric water heating simulator and the validation of a double and single tank domestic hot water configuration. The brief study and the survey was done over the whole system and it is all implemented in the report. Water heating in general is a basic heat transfer process that generally uses an energy source in order to heat water above the initial temperature. As we know the usage of hot water is maximum for not only daily purpose but also for cooking, cleaning, bathing, and space heating. In industry, predicament and water heated to steam have many uses also. Water is heated in vessels known as water heaters, kettles, cauldrons, pots or coppers. These metal vessels don't produce a continuous supply of heated water and thus water heating tap comes into picture. The aim of the article is to study, design and fabricate such model.

Keyword: *Water tap, heating, coil, heat transfer, temperature, vessel, thermostat.*

1. INTRODUCTION

As we know that over the several years the efficiency of the water heater has become an important characteristic. This is the result of government regulation and also heightened consumer awareness concerning the consumption of natural resources. Accidentally concern for the environment has made the elimination of potentially polluting substances from the products of the combustion more important. While the project in which we are making the water tap heaters are comparatively less pollutant because the material and substances which we are using are not harmful to the environment. Not only water tap heaters but there are many types of heaters which are less pollutant to the environment and are very useful in certain ways. Government bodies and consumers have sought to further reduce the contribution of pollutants emanating from water heaters, so taking this into consideration, we are thus contributing to a project that is less hazardous to the environment. Electric water heaters (EWHs) have, for decades, been explored and recruited for demand response or demand-side management (DSM) programs, particularly peak shaving. However, these applications were reduced in power system application potential owing to limitations of the era, particularly in control and communications technology. This also restricted the number of programs, beyond peak shaving, to which they could be applied. The role of this document is to introduce the reader to this potential and approaches to assessing and capitalizing on it. [1].

1.1 Problem Statement

In an age where conserving electricity is the need of the hour most of the households and apartments have turned to solar water heaters as an alternative to energy. The drawback of the solar system is that in the morning the cold water stored in the pipeline coming from the solar heater has to be flushed out before the consumer begins to get the hot water which may result in a great amount of water being wasted is a great loss. The instant water heating tap is a simple and clean solution to reduce wastage of water as well as time. This water heater system is installed near the water tap. When the consumer turns ON the tap and if the incoming water from the pipeline is cold initially then the system senses it and then turns ON the heater thereby providing heated or hot water. Once the hot water from the main solar heater starts flowing, this instant heating system turns OFF automatically. The instant heating concept can save water, time, and energy.

1.2 Objectives

1. To obtain a detailed knowledge about the demand for tap hot water systems in the institutional sector as well as about the technical, social and economic barriers, which hamper the installation of the systems.

2. To change manually system water tap to become automatic system water tap heater.

3. To reduce wastage of water that always occurs at water taps.

4. To reduce direct contact to the device for prevent from bacteria.

5. To reduce the extra work that is needed for doing the heating of water and sum up the whole two different systems over to a single system.

1.3 Aim

The most important aim of this project is to obtain hot water directly from the taps. Hot water equipment which are installed nowadays are very bulky and expensive. Also they are difficult to install and need a special trained person to install. Therefore, we aim to make water tap heater which will be convenient to use and which will be easy to install for everyone. Also reducing its cost is our important aspect. Over all we aim to create an easy to install, compact and simple water heater which can be installed directly on water taps.

1.4 Scope of the Project

1. The system will automatically bring ease to the human efforts and will reduce the workload.

2. The system is making use of thermostat which will be automatically in build over the system that is the tap and no external device will be required to make the water system run or rise the temperature.

3. The system will have selector through which it will be easy to make use of water as per the need.

1.5 Advantages

1. Low in cost-

2. No extra piping system required

3. The size of the system is not bulky a tall.

4. The temperature achieved also satisfying needs.

5. Safety

1.6 Disadvantages

1. Heating time and recovery rates

2. Power outages

2 LITERATURE REVIEW

William J. Rhoads et al, in this paper the author has found that lowering water heater temperature set points and using less drinking water are common approaches to conserving water and energy; yet, there are discrepancies in past literature regarding the effects of water heater temperature and water use patterns on the occurrence of opportunistic pathogens, in particular Legionella pneumophila. Their objective was to conduct a controlled, replicated pilot-scale investigation to address this knowledge gap using continuously recirculating water heaters to examine five water heater set points [1].

S. Wong et al, Conventional electric water heaters (EWHs) have innate, large thermal storage capacities. Aggregated together, operators controlling populations of EWHs can and do utilize this storage to offer demand response (DR) services such as peak shaving to the power system grid. The significant penetration of EWHs in many provinces within Canada makes such solutions feasible and even enticing. The role of this document is to introduce readers to concepts, techniques, and models that they themselves can use to evaluate the full DR potential of EWHs. [2].

Mei WU et al, In this paper their findings are in such a way that due to the capacity of thermal storage, electric water heater (EWH) is one of the best candidates for demand response programs. However, few attentions are given to the modeling and optimization of EWHs with thermostatically-controlled automatic water mixer (TCAWM). In this paper, differential thermo dynamic models established for EWHs with TCAWM and a piecewise linear approximation method is performed for the nonlinear thermodynamic model [3].

N.B. Bhawarkar et al, In this paper the study related to extensive growth of population development and technology has leads to the need of proper utilization of the natural resources especially water. Thus our proposed system and the review of all the possible implementation of technology is the first step toward prevention and proper utilization of water. To overcome the problem of the water theft vandalism and mainly the automation in water distribution system is successfully implemented. The review of automated water distribution system with the various controllers and parameters focuses on the entities such as proper supply, red alarm pop-ups, filtration, flow control, supervision using various protocols is concluded with the future aspects of real time implementation in the municipal corporations where scarcity of water is the huge issue [4].

3. METHODOLOGY

While analyzing the various other problems during the study, these problems were quite a difficult to tackle and this has been the serious issue coming overlap. So we have decided to solve the problem to some extent and that why how we have made our problem statement. After the problem statement there is an objective of the project, it is mentioned because while your problem formulation serves to describe the aim of the project, the objectives provide an accurate description of the specific actions you will take in order to reach the aim the targeted aim. As with the problem formulation, the overall objective should be framed in the single sentences. Thus objectives gets finalized in this manner. The scope of the study or the project explains the extent to which there search are a will be explored in the work and specifies the parameters within the study will be operating. Basically, this means that you will have to define the exactness and the reason and the subject what we are focusing on. It is nothing but the detailed outline of the aspects of all over the project, including all the related activities, resources, timeline and deliverables, as well as the project boundaries. The methodology is the key and important part of dissertation. The methodology describes the broad philosophical underpinning to your chosen research methods, including whether you are using qualitative or quantitative methods, or the mixture of both. The literature survey gives the chance to demonstrate your familiarity with the topic and scholarly content. It consists of the detail study of the previous activities, articles, books, conference proceedings and other resources that are relevant to the particular issue, are a of the research, or the theory and provide the context for the same. Here we have done the literature survey of various papers related to the topic and studied lot many methods including heating of water from various other sources.

4. CONSTRUCTION AND DESIGN

4.1 Construction

The construction of our proposed design is quite simpler and is been tried to make it less bulky and easy to install. The overall system looks like a C shape cum U shape like structure which is shown in fig below. The system consists of thermostat which will help the system to maintain the temperature and it is also consist of the heating coil. Here we are making use of 2 heating coils which will be more convenient to use. The overall structure of the system is made up of copper tube. This pipe is made up of copper tube

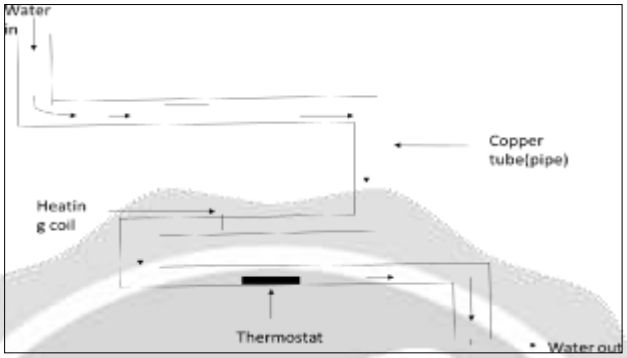

Fig-1: System structure of water tap heater

4.2 Components used

Fig-2: Thermostat

Fig-3: Heating Coil

Fig-4: Copper Tube

Table -1: Components

Sr.no.	Component / Process	Make/Brand
1	Copper Pipe (2 Feet, Elbow 3/2 PVC)	Patil Steels
2	Heating Coils, Thermostat and Silver Foil	Nagesh Traders
3	Hardware M Seal	Local Hardware Elbow
4	Local Hardware Cutting of the Pipe	Khan Fabrication

4.3 Working

When the water tap is turns on the water starts flowing through the heating coil. Heating coils help convert electricity into heat. And this heat is transferred to the water by means of convection. Therefore we finally get hot water directly from the taps. Here we have also used thermostat is a device which is used to maintain desired temperature in a system. Thermostats work on the principle of thermal expansion. This principle governs the switching off or on of the electric circuit. The most common types of mechanical thermostats typically use either bimetallic strips or bellows filled with gas. While digital thermostats use the same principle, but everything is controlled by a chip and built- in minicomputer. Hence whenever if the temperature increases the desire amount therefore to avoid injuries, we have attached thermostat so that it will not heat up so much.

Fig-5: Actual Model

5 CALCULATIONS

Given: D1 = 27 mm = 0.027 m , r1= 0.0135m
D2 = 25 mm = 0.025 m , r2= 0.0125m
L= 150 mm = 0.15m
K= 401 W/mk
T1= 80ºC = 80 + 273 = 353 k
T2 = 24 ºC = 24 + 273 = 297 k ...assume initial temperature

Solution:

(1) To Find Heat Transfer by conduction (Q),

$$Q = \frac{2 \; X \; \Pi \; X \; l \; X \; k \; (T1 - T2)}{2.3 \; log \; (\frac{r2}{r1})}$$

$$Q = \frac{2 \; X \; \Pi \; X \; 0.15 \; X \; 401 \; (353 - 297)}{2.3 \; log \; (\frac{0.0125}{0.0135})}$$

Q = 275.32 X 10^3 W/mk / J/m^2 k.

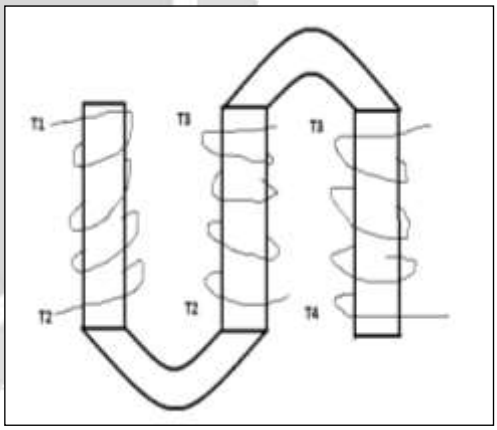

Fig-5: Sketch of Setup

(2) To find temperature (T2):

$$Q1 = \frac{T1 - T2}{\frac{x1}{k1.A1}}$$

$$275.32 \text{ X } 10^3 = \frac{\frac{80-T2}{0.002}}{4.1 \; X \; A1}$$

Now for finding A1,

A1 = 2 .Π r1.L

= 2 X Π X 0.0135X 0.15

A1= 0.012723 m^2

A2 = 2 Π r2.L

= 2 X Π X 0.0125X 0.15

A2 = 0.011780 m^2

A = A1 + A2

= 0.012723 + 0.011780

A = 0.02450 m^2

A = 0.02450 m^2

(3) To find T3:

324.48 X 2.035 X = 28 – T3

66.03 = 28 – T3

T3 = 38.03 ºC

(4) To find T4:

Q3 X k3 X A3 = T3 – T4

471.98 X X 2.035 X = 38.03 – T4

96.04 = 38.3 – T4

T4 = 58.01 ºC

CONCLUSION

Our study basically provides the new window of understanding the facts that will generally ease down the human efforts and extra work that can be needed to do while heating the stuff. This system will generally help down to resolve the problems that will be not so ever being a dangerous situation for the people. Thus this instant water heater is designed as a solution to the problems arising due to solar water heaters, gas water heater or any other water heaters. This system only supplies water when the incoming water from the solar heater is not hot enough for the user to utilize it and this is made sure with the help of a temperature sensor which is suspended in the Copper tube pipe at the point just before where the water flows into the heating block (copper pipes upon which the heating coil is wound). The output of this temperature sensor is driven by a relay circuit which either cuts off power.

FUTURE SCOPE

We can surely do lot many things in future related to this project in such a way by making use of ongoing technologies over it. The list are as follows:

1. Well mounted tap heater: This compact and sturdy tap heater will provide you with heated water within a few seconds, unlike conventional heaters that require time to heat up.

2. Adjustable tap water heater: This tap water heater will give a lasting performance with its temperature resistant, strong and body that has anti-stamping qualities. The tap heater will provide about 30-40 degrees water in colder temperatures.

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