



International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijirccce.com

Vol. 5, Issue 2, February 2017

Server Temperature Maintenance System Using Water Inject Technique

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ABSTRACT: We have designed the project named **Server Temperature Maintenance System Using Water Inject Technique**. This project is basically the main alternative for A/C in the function of server cooling. It can also be used to cool down the processors in our personal computers (pc). There are many more applications of this project. The main objective of this system is to maintain the temperature of server blocks. The fan blows the cold air to maintain the temperature of these blocks. For personal computers, we have the simple computer fans and for the server rooms we have to use the exhaust fans. Water-cooling technology is adequate as it has low cost, high availability and better serviceability. For the computer system, as a whole, a water inject cooling system may be optimized. Such a system typically requires pumps to drive the water loops, water movers to drive water and blowers or fans to drive the air flow for component cooling. It is the focus of this paper to study the optimum allocation of energy between the pumps and water movers for a given total cooling energy budget and overall load. The goals are to achieve better overall thermal performance and to reduce the cooling energy consumption.

KEYWORDS: Computer fans, Exhaust fans, Water movers, Alternative, Cooling energy consumption

I. INTRODUCTION

- Main components used in water inject server cooling system.
- For using this system in cooling of processors in personal computers.
- Copper piping (around 0.5 inch in diameter and flexible).
- Water pump
- Water tank (small in volume can be used)
- Computer fan

For using this system in industrial use (cooling of server blocks in the server rooms).

Co Copper piping (around 1 inch in diameter and flexible).

1. Water pump
2. Water tank (here we use reservoir tank).
3. Exhaust fans (we need at least 2 exhaust fans).

- Information about components in Water Inject Server Cooler.
The components used in these have some specific functions.

Components in cooling system of personal computers:

Copper piping: Here the copper pipes of about **0.5 inches** are used and they are also flexible. These are to be wound around the computer fans. They are used as water mover that takes the water through it and take the water back to the tanks so that the water can be recycled.

Water pump: They are used to pump the water through the tanks into the copper piping, round the fans and back to the water tanks.



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Water tanks: They are used to store the water used to circulate the water through the copper piping and to take back the recycled water through the copper piping. In this setup, we can also use the reservoir tanks.

Computer fans: Here we use the computer fans as they need less voltage and they have a high power to blow the air. They are also compact in size and can be easily fitted in the inside of CPU box. They are wound by the copper piping.

Components of cooling system of server blocks in server rooms:

Copper piping: here the copper pipes of about **1 inch** are used and they are flexible too. These are to be wound around the exhaust fans. They are used as water movers that take the water through it and take the water back to the tanks so that the water can be recycled.

Water pump: They are used to pump the water through the tanks into the copper piping, round the exhaust fans and back to the water tanks.

Water tank: they are used to store the water used to circulate the water through the copper piping and to take back the recycled water through the copper piping. In this setup we need to use the reservoir tank.

Exhaust fans: They need a greater voltage but can be used to cool the server blocks in a less period of time. They are to be fitted in the server rooms. They are wound by the copper piping.

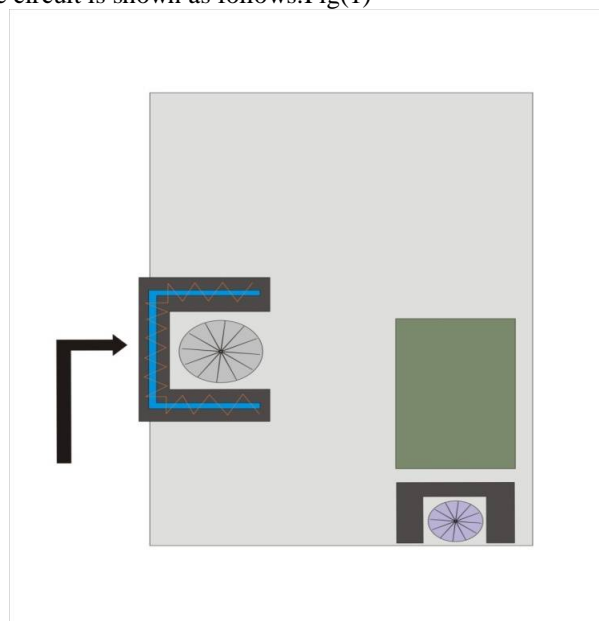
II. WORKING

The working of this system is done by assembling the components in two ways. One for personal computers and one for server blocks in server rooms.

For personal computers:

For personal computers, we need to assemble the components. The components are Copper piping, Water pump, Water tank (reservoir tank), and Computer fan.

First, we drill out and fit the computer fan inside the CPU unit box. Then we connect the copper piping to the outlet, then we wind the copper piping round the fan and then take it back to the tank a connect it to the inlet of the tank so that the water is recycled. The pump is attached to the tank so that the water can be pumped into the copper piping. The tank that we use is the reservoir tank. The circuit is shown as follows:Fig(1)



Fig(1):Circuit Diagram

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Here the diagram fig(1) shows that how it can be assembled in the CPU unit. The green box shows the Processor, the wheel like diagram shows the computer fan, the blue line indicates the water movement around the fan, and the arrow shows the direction of flow of water. The actual working of this system starts when we simply turn on the pump. When it is turned on the water movement begins through the copper piping and it is flown through the winding of this copper piping around the fan. The piping becomes cool as we pump the cool water from the tank. The reservoir tank makes the water cool. The cooled copper piping makes the fan cool too. As the fan is cooled it blows the cold air towards the processor cooling it very fast. This helps in good and smooth functioning of the processor without the problems that the processor creates when it becomes hot. The pump is as shown below. Fig(2)



Fig(2):Used for pumping of water

The water from the piping comes back to the reservoir tank recycling the water. This is the simple setup and functioning of the **Server Temperature Maintenance System Using Water Inject Technique for personal computers (pc)**.

For server blocks in the server rooms:

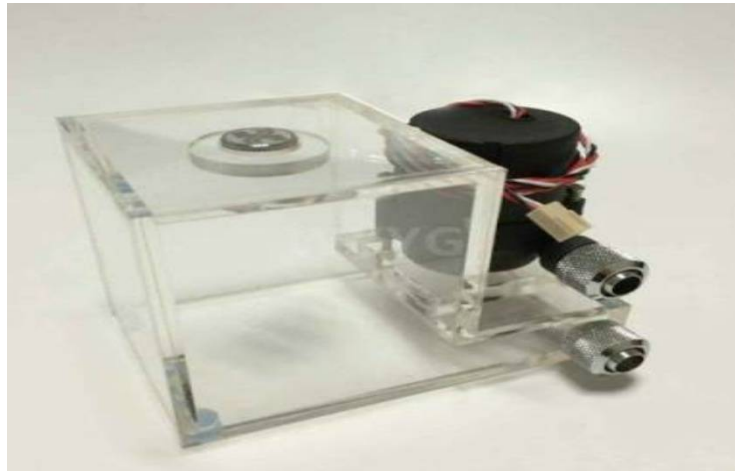
For server blocks in server rooms we need to assemble the components. The components are Copper piping, Water pump, Water tank (reservoir tank), and Exhaust fans. First, we set the two exhaust fans in perpendicular direction to the server blocks we need to cool. Then we do the piping work. We wind the copper piping around the exhaust fans. Then we connect these piping to the reservoir tank and attach the pump to it. Then to activate the system we have to simply turn on the pump and the exhaust fans. When the pump is turned on, the water starts moving through the piping. The cold water when runs through the piping, it makes them cool. The exhaust fans are cooled too due to the cooling of the copper piping. The exhaust fans then blows the cold air towards the server blocks making the functioning more smooth and efficient and nullifies the problems that happen when the server becomes hot. The reservoir pump image shown in fig(3):

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Fig(3) Reservoir tank and pump

- **Analysis**

Fan size is 92mmx92mm and total dimension should be 105mmx105mm.

We are using the concept of forced convection here. It means that if the fluid motion is imparted by external means like pump, fan, compressor, slope, etc. the convection is called forced convection

We here use incompressible liquid i.e. water. Here we use this as the density changes are negligible with changes in pressure.

On further calculation we come to know that

$$\begin{aligned} Q &= h \times A \times (T_s - T_{\text{fluid}}) \\ &= 200 \times 1 \times (20 - 27) \\ &= 200 \times 1 \times (-7) \\ &= -1400 \text{ W/sq.m.} \end{aligned}$$

This is the amount of energy removed from the hot air.

III. CONCLUSION

This system is the main alternative for A/C used to maintain the temperature in the server rooms. A/C is also used in the computer labs to maintain the temperature on the personal computers. But when we use A/C in the server rooms to maintain the temperature of the server blocks, the whole room is cooled by default. This increases the energy consumption and gives a heavy amount of bill to the company. When the A/C is used in the computer labs, every individual processor is not efficiently cooled. This may lead to loss of data which can result in heavy loss for that institute.

When we use, the **Server Temperature Maintenance System Using Water Inject Cooling Technique** for these applications, we have the main benefit of cost efficiency. This project is low cost, easy to use and very efficient.

When we use it in the server rooms to cool the server blocks, we can focus on the parts to cool, i.e. the server blocks that we have to cool. This consumes a very low amount of energy and works efficiently. Focusing on the server block reduces the cooling time and functioning of this block smoother.

When we apply it in every personal computer in the lab or anywhere, it overcomes the deficiency of A/C, and cools each and every personal computer's processor. This helps in the smooth functioning of the computer and nullifies the defects that are created by overheating of the processor. This also maintains the temperature of the processor and focuses only on the processor. This also reduces the cooling time of the processor which cannot be gained by only just one computer fan. It increases the performance of the computer.



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Reservoir tank: Reservoir tank is used in this system because it continuously cools the water in it. We need cool water in this system continuously and this need is fulfilled by the reservoir tank. The reservoir tank has the inlet as well as the outlet which helps in the recycling of water. We just need to change water once in 2 months. This is not available in A/C. The air blows throughout the room without focusing on the server block or every personal computer in the lab. We can use only one reservoir tank for the whole lab. It just has to be fitted in the lab and the piping has to be done for every personal computer. Reservoir tank is one of the main components of this system.

*This system is the main **Alternative** for A/C and **not Replacement** for A/C. The main drawbacks of the A/C that is non-focusing and energy consumption are overcome by this **Server Temperature Maintenance System Using Water Inject Cooling Technique**. As stated before there are many applications of this system, one of the other main functions is ventilation of a medium sized room. We have to simply assemble this system in the same way in this room. The function is the same. If someone is feeling suffocated in a particular room, we can simply turn on this system and the air can run through the room. Hence the **Server Temperature Maintenance System Using Water Inject Cooling Technique** having the main function of cooling the processors and the server blocks in the server rooms, there is one more function of this system that is ventilation. This is also more cost effective and energy conserving system than A/C.

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