IOSR Journal of Engineering (IOSRJEN) **www.iosrjen.org**
ISSN (e): 2250-3021, ISSN (p): 2278-8719
PP 63-65

A new cooling system for a single cylinder internal combustion engine for maintaining a constant ideal engine temperature

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Abstract: *A new cooling system for a single cylinder internal combustion engine for maintaining a constant ideal engine temperature is shown. This system consists of a number of separate pipes carrying water passing around the engine cylinder. It consists of a fan that is used for cooling by forced convection. It consists of a number of temperature gauges for measuring the temperature and a heating system for solving the problem of cold starting. By using this system the problems of overheating of the engine, cold starting can be prevented and also the problem of knocking and detonation can be reduced to a certain extent.*
Keywords: *cold starting, detonation, force convection, gauges, knocking*

I. Components And Their Functions-

- **Pipes carrying water** (the number of pipes depends upon the extent of accuracy of the temperature distribution which needs to be fed to the ECU)
- **Temperature gauges**, there is one temperature gauge for each pipe.
- **Distributor**, it varies the mass flow rate through each pipe depending upon the information provided by the ECU which decides the mass flow rate for each pipe depending upon the information it gets from the temperature gauges regarding the temperature distribution in the engine cylinder
- **Comparator**, it compares the temperature of the incoming fluid (i.e. the water containing the heat taken from the engine cylinder) with the predetermined value which is basically the optimum temperature at which the engine should run at that specific load. Depending upon the load on the engine this predetermined value should be varied thus allowing the engine to always run at the optimum temperature at that specific load. On comparison there are three possibilities

A-value is greater than the predetermined value in such case the water is allowed to flow through the cooling region.
B-value is less than the predetermined value in such case the water is allowed to flow through the heating region.
C-value is equal to the predetermined value in such case it is allowed to flow directly to the distributor.

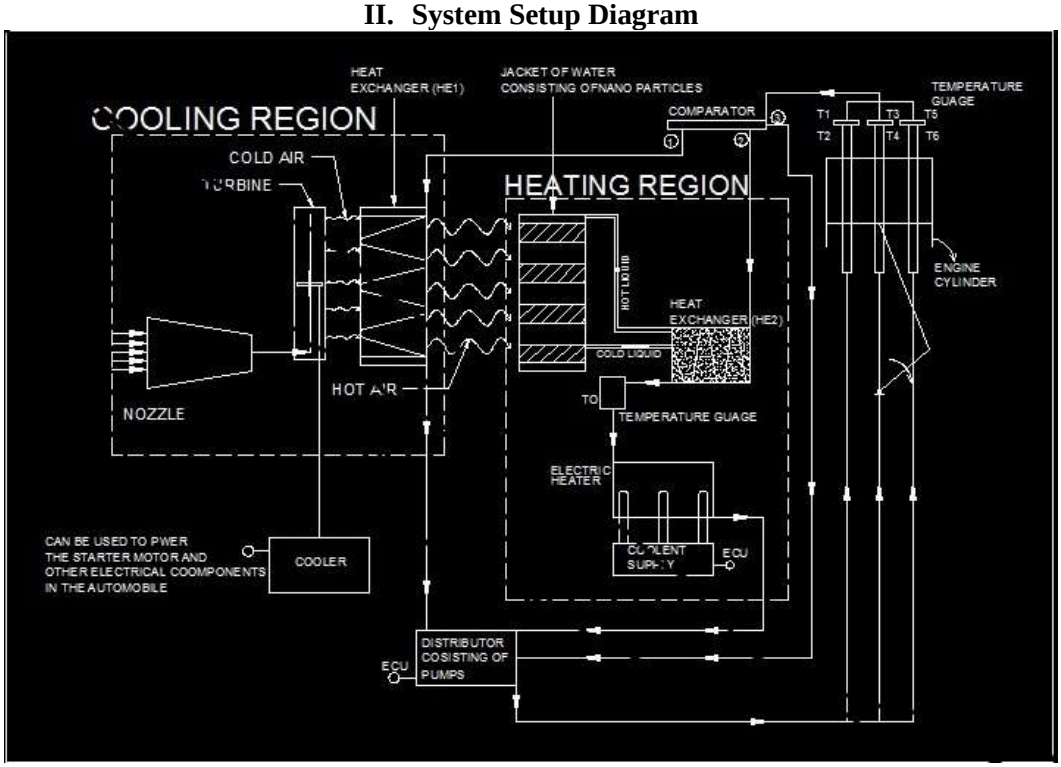
- **Generator-**it generates power from the rotation of the fan blade and can be further to power other devices
- **Cooling region**-it consists of the following components

A-nozzle, it is used to increase the velocity of the incoming air and impinge it on the turbine (fan) blades so as to initiate its rotation
B-turbine (fan),it is used to suck more air and impart high velocity air on the pipes containing water which carries heat collected from the cylinder of the engine and thus cools the water which can further again be used to take away heat from the engine cylinder
C-heat exchanger 1, in this heat exchanger heat transfer takes place between the cool air and the hot water in the pipes

- **Heating region-**it consists of the following components

A-jacket of water consisting of nanoparticles, the water containing nanoparticles has high specific heat capacity and it takes away heat from the hot air coming from the heat exchanger 1 and further move into heat exchanger two
B-heat exchanger 2, here heat transfer takes place between the hot water containing nanoparticles and the cold coolant (water)
C-temperature gauge T0,it measures the temperature of the water coming out of the heat exchanger 2 and sends this information to the ECU which helps in determining the amount of ci=current to be sent to the electric heater so as to obtain the optimum temperature.
D-electric heater, depending upon the electric current
Supplied, which is decided by the ECU it heats up the water in it

II. System Setup Diagram



III. Working

With the help of the pump water is continuously circulated in the system. Firstly the water in the pipes take away the heat from the cylinder walls and move towards the temperature gauges T1, T2, T3, T4, T5, T6 .there is one temperature gauge for every pipe .The number of pipes depends upon the extent of accuracy about the temperature distribution in the engine cylinder required, more the number of pipes more will be the accuracy obtained. The temperature gauges are used to determine the temperature distribution within the engine cylinder, If the temperature in any of the incoming pipes is very much different from the temperatures in the water of the remaining pipes then it is noted and this information regarding the approximate location of such temperature variation is sent to the ECU.After this the water is collectively sent to the comparator which compares the temperature of the water with the ideal predetermined temperature. If the temperature is less than the ideal predetermined temperature then it is sent to the heating unit and if it is more than the ideal predetermined temperature then it is sent to the cooling unit and if it is equal to the predetermined temperature it is directly sent to the distributor.

After the water is brought to its ideal temperature it is sent to the distributer from where it is sent to the various pipes. The mass flow rate of the water in each pipe depends upon the temperature noted by the temperature gauges initially and is controlled by the ECU. In the cooling region the atmosphere air is made to impinge on the turbine(fan) blades by high velocity with the help of the nozzle and thus the fan starts rotating with high velocity which further increases the amount of air coming in and is used to cool the heated water[4]. Thus the water cools and can be further used to again cool the cylinder of the engine. After this the cooled water is passed to the distributor and this process continues. In the heating region the hot air coming from the heat exchanger 1 is made to pass through jackets of water containing nanoparticles. These jackets have high specific heat capacity and thus take away the heat from the hot air [1]. This hot fluid is made to transfer its heat to the cold water in the heat exchanger 2 and thus the temperature of the water increases which is further passed to the temperature gauge T0.Depending upon the temperature difference of the water coming from the heat exchanger 2 and the predetermined temperature the ECU supplies current to the electric heater which thus heats the water to the required temperature. The use of the heat exchanger 2 helps in saving some amount of electric current used in the electric heater by preheating the water. After this the water is further passed to the distributor.

IV. Advantages Of Using This System (Conclusion)

- The problem of cold starting can be eradicated as this system consists of the heating region which helps in maintaining the temperature in the engine cylinder
- The problem of knocking and detonation can be reduced to a certain extent as the temperature gauges of the respective pipes help in understanding the temperature distribution in the engine cylinder and any kind of temperature variation in the engine cylinder which causes detonation and knocking can be detected and the temperature in the engine cylinder can be maintained by the ECU by controlling the mass flow rate of the coolant (water) flowing through the pipes around the engine cylinder.
- The turbine (fan) helps to take in more air and thus faster cooling and can be used to generate electricity with the help of the generator which can be used to run various devices in the automobile.
- The jackets of water containing nanoparticles help to take away the heat present in the air coming from the heat exchanger 1 which would otherwise be wasted and is used to heat up the coolant (water), this gives less load to the electric heater and hence saves electricity.

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