PROJECT REPORT

"GROUND COUPLED CLOSED CYCLE HEAT EXCHANGER COOLING SYSTEM"

In partial fulfillment of the requirements for the Award of the degree of

BACHELOR OF ENGINEERING
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MECHANICAL ENGINEERING

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ABSTRACT

The present scenario calls for a cheap, eco-friendly and efficient alternative to our existing air conditioning and heating systems. The average temperature below the earth's surface at a depth of 3-6 m is scientifically known to be in range of 10-28 ^{0}Cagainst a much hotter or colder surface temperature (which is influenced by pertaining weather conditions).Hence this temperature difference can be tapped in a beneficial way to form a heating or cooling system depending upon our need.

Ground coupled closed cycle heat exchanger cooling system is being installed to study its performance in cooling mode. The system is made of 20 m long ceramic as well as CAL steel pipes of 0.1 m nominal diameter and 0.005 m wall thickness. The system is buried 5 m deep below the surface. Ambient air is pumped through it by a 0.73 kW centrifugal blower coupled to D.C motor. Air velocity in the pipe is varied and the velocity at which optimum heat transfer takes place is determined. Air temperature is measured at the inlet of the pipe, in the middle of the feed pipe and return pipe and at the outlet by RTD type temperature sensors placed inside the pipe. Soil temperature is measured by an externally placed sensor at a depth of 4m. advection of water around the cooling tubes is also considered to improve heat transfer co-efficient. Cooling tests were carried out for three consecutive days in each month. On each day system was operated during the day and shut down for the night, also the system was run for day and night to check heat transfer sustainability. Test results are presented in summary form for each month. Detailed analysis is presented for two months only – April, May for cooling.

Ground coupled closed cycle heat exchanger cooling system cools the ambient air in April, May by as much as 11^{0}C. It heats the ambient air in April, May nights also by as much as 7^{0}C. The COP for cooling mode was 5.5 and it dropped to 3.4 in heating mode.