International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2013): 6.14 | Impact Factor (2013): 4.438

Temperature Control for Different Industrial Heat Exchanger by Using PID

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Abstract: ***Now days any manual application is quite difficult as compare to the automatic operation. And therefore we are going to use a heat exchanger system to transfer the heat in different variety applications of the industry. Actually there is different ways to transfer the heat or thermal energy between the physical system depending on the temperature and pressure, by dissipatingheat. The fundamental modes of heat transfer are conduction or diffusion, convection and radiation. Heat transfer is a process as opposed to functions of that amount of heat transferred in a thermodynamic process that changes the states which depends on how that process occurs, not only the net difference between the initial and final states of the process. For instance, steam generators, feedwater heaters, reheaters and condensers are all examples of heat exchangers found in nuclear power systems also the heat transfer rateacross a heat exchanger is used. So by using such system with improved technology in the industry can be used for transfer or exchange the heat with the necessary sections.***

Keywords: Heat Exchanger system, PID Controllers, Water temperature sensors, Heat transfer coefficient, tube spacing

1. Introduction

Generally Heat transfer and exchanger system is used in chemical as well as process, brewellary and different types of the industry. Because it can sustain variety ranges of temperature and pressure. The main purpose of a heat exchanger system is to transfer heat from a hot fluid to a cooler fluid, so temperature control of outlet fluid is of prime importance. Due to inherent disadvantages of conventional control in the Techniques, model based control technique is employed internal model based PID (proportional, integrator and derivative) controller is develop to control the temperature of outlet fluid of the heat exchanger system. The classic example of a heat exchanger is found in an internal combustion engine in which a circulating fluid known as engine coolant flows through radiator coils and air flows past the coils, which cools the coolant and heats the incoming air. Heat transfer describes the exchange of thermal energy, between physical systems depending on the temperature and pressure, by dissipating heat. The exchange of kinetic energy of particles through the boundary between two systems which are at different temperatures from each other or from their surroundings. Heat transfer always occurs from a region of high temperature to another region of lower temperature. On a microscopic scale, heat conduction occurs as hot, rapidly moving or vibrating atoms and molecules interact with neighboring atoms and molecules, transferring some of their energy to these neighboring particles. This paper wills deals that consider heat exchanger and built a single input and output model of the system with the help of experimental data available.

2. Literature Survey

While literature on heat exchangers and heat transfer is limited information how the performance of the exiting unit can be calculated with the certain parameters. To provide such information in this system.The purpose of the article is to present a procedure for measuring the performance of determining the individual heat transfer coefficients for both sides given limited information from the experiment, Overall heat transfer coefficient and pumping power were experimentally determined for a fixed tube length and surface area of serpentine layouts with different number of bends and results are compared with straight tube[1] Normally A heat exchanger consists of heat transfer elements such heat transfer surface, and fluid distribution elements such as headers, manifolds, tanks, inlet and outlet nozzles or pipes, or seals. Usually, there are no moving parts ina heat exchanger. In our system we generally used a heat exchanger system with block diagram that consist of main heat exchanger operational control unit with brazed plate heat exchanger at the low pressure and water temperature sensor with negative temperature coefficient [3].Future scope the thermal enhancement of system can be studied byincreasing and decreasing the number of different plates with their shapes on the heat exchange systems [2].

3. System Design

Hardware Design:

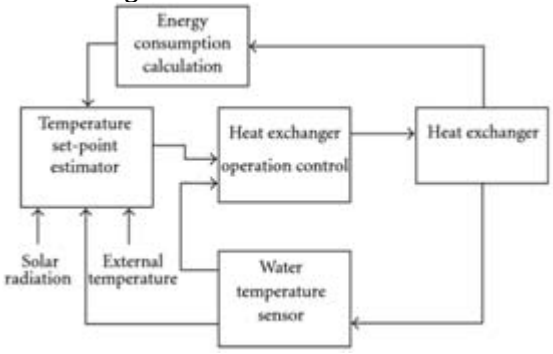

Figure 1: Heat Exchanger System Control Scheme

As shown in above diagram complete unit of the Heat exchanger is shown for the different industrial unit in variety of the applications. Sunlight is electromagnetic energy, which is propagated by electromagnetic waves. Health wise, the most important parts of the sunlight electromagnetic spectrum are like aUltraviolet radiation(UV), invisible to the eye visible light that allows us to see and Infrared radiation, which is our main source of heat but is also invisible, that energy is given to the heat exchanger operation unit that Heat exchangers transfer heat from one working fluid to another. Heat exchanger again it will give to the consumption calculation and temperature sensing element. PID controller will play an important role for ThePIDcontrollerisbyfarthemostcommoncontrolalgorithm.Mostpracticalfeedbackloopsarebasedon PIDcontrolorsomeminorvariationsofit. Thousands of instrument and control engineers world wide are using such controllers in their daily work. The PID algorithm can be approached from many different directions. But it can also be approached analytically. Main types for such operations are Air- Cooled Heat Exchanger, Plate Type Heat Exchanger and Shell and Tube Type Heat Exchanger it includes respectively Air cooled heat exchanger is a tubular heat transfer equipment in which air passes over the tubes and thus acts as the Cooling medium, the plate type heat exchanger consists of a thin, rectangular metal sheet upon which a corrugated pattern has been formed by precision pressing. One side of each plate has a full peripheral gasket. Shell and tube type heat exchangers are the most versatile and are suitable for almost all applications, irrespective of duty, pressure and temperature. The major emphasis in this chapter is placed on introducing the terminology and concepts associated with a broad spectrum of commonly used industrial heat exchangers of the system with different small units with variety of the set points.

3.1 Classification of Heat Exchanger

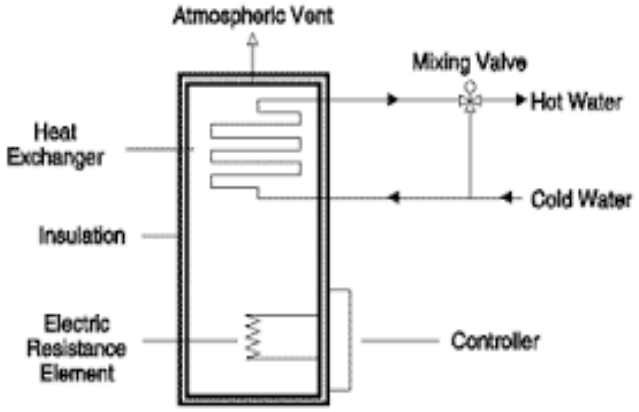

Figure 3.1.1: Indirect-Contact Heat Exchangers

For these techniquesindirect-contact heat exchangers, the fluid streams remain separate and the heattransfers continuously through an impervious dividing wall or into and out of a wall in atransient manner.

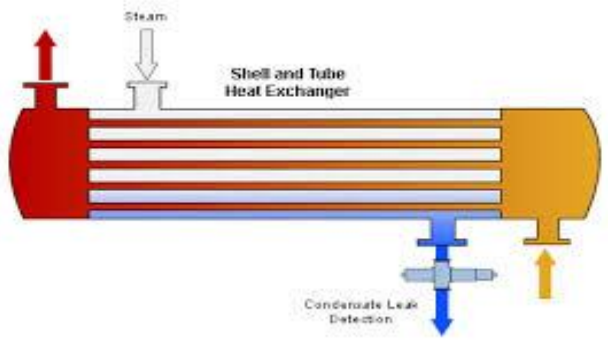

Figure 3.1.2: Indirect-Contact Heat Exchangers

Direct contact Heat exchange takes place between two process streams. The streams can include combinations such as gas-solid, gas-liquid, liquid-liquid, liquid-solid, or solid-solid streams. For obvious reasons, gas-gas systems cannot be achieved directly however, two direct contactors can be used in series where a third stream extracts heat from one gas stream and transfers it to another.

Software Design

For transfer of heat we need some software based platform for that use in the teaching of thermal and hydraulic design of shell and tube heat exchangers usually at the senior undergraduate level of a mechanical or chemical engineering course. It may also be used for the preliminary design of actual industrial applications. Developed in Borland International's Delphi programming environment with advanced graphics features, the Microsoft Windows-based software can be implemented on an IBM or Compatible personal computer with at least A80386microprocessor, 4MB of RAM and At least 5MB of free hard disk space will required.

4. Conclusion

A setup for Heat exchanger experimentation was done for the selection of a thermal fluid, and error estimation. The heat exchangers can also be used to recover the resources like water as it is converted into the steam which is condensed by using the condenser. Heat exchangers can be useful for the economical running of industries and to control the pollution as in case of economizer and air pre-heater systems.

References

[1] R. Hosseini, A. Hosseini-Ghaffar and M. Soltan " Experimental determination of shell side heat transfer coefficient and pressure drop for anoil cooler shell-and-tube heat exchanger with three different tube bundles", Applied thermal Engineering ,Volume 27, Issues 5-6, Pages 1001-1008, April 2007.

[2] Milind V. Rane and Madhukar S. Tandale " Water-to-water heat transfer in tube—tube heat exchanger: Experimental and analytical study",Applied Thermal Engineering ,Volume 25, Issues 17-18, Pages 2715-2729, December 2005.

[3] Capstone Turbine Corporation: Technical ReferenceCapstone Model C30. Rev. D (April 2006)
[4] Apu Roy, D.H.Das, "CFD Analysis of a Shell and Finned Tube Heat Exchanger for Waste Heat Recovery Applications", International Journal of Mechanical & Industrial Engineering, Volume-1 Issue-1, 2011
[5] S. S. Shinde, P. V. Hadgekar, S. Pavithran, "Comparative Thermal Analysis of Helixchanger with Segmental Heat Exchanger Using Bell delaware Method", International Journal Of Advances In Engineering & Technology, May 2012. ISSN: 2231-1963
[6] ASME, 1998, ASME Boiler and Pressure Vessel Code, Sec. VIII, Div. 1, Rules for Construction ofPressure Vessels, American Society of Mechanical Engineers, New York.