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A REVIEW ON ABSORPTION HEAT TRANSFORMER SYSTEM

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Abstract:
System is absorption Heat Transformer that is having special capability. The capability is to raise temperature of small or moderately warm waste heat sources to major levels. Study is considering investigation in order to analyze Absorption Heat Transformer systems which make use of water lithium bromide solutions that have water as refrigerant. Operating sequence has been explained as well as thermodynamic system analysis has been discussed here. Applications of Absorption Heat Transformer system to industrial company are discussed in this paper.

Keywords: AHT, Refrigerant, Transformer, Thermodynamic

[1] INTRODUCTION

Heat transfer is a discipline of thermal engineering that concerns generation, use, conversion, & exchange of thermal energy between physical systems. Heat transfer has been categorized in various mechanisms, like thermal convection, thermal conduction, thermal radiation, & transfer of energy during change of phase. Engineers are also considering transmission of mass of differing chemical species. It may be either cold or hot in order to achieve heat transfer. While such mechanisms have distinct characteristics but they often occur in same system simultaneously.

Heat conduction known as diffusion, is direct microscopic exchange of kinetic energy of particles through boundary between two systems. If any object is at different heat level from another as compared to its surroundings. Heat flow that body & surroundings that have common temperature at point they have thermal equilibrium. Such impulsive heat transfer always happens from a region of high temperature. It occurs to different region of lower temperature. It has been described in second law of thermodynamics. Heat convection happens. It occurs during flow of a fluid is going to carry heat that is having flow of matter in fluid. Flow of fluid might be forced by external processes. Sometimes by buoyancy forces caused when thermal energy expands fluid. Thus influencing it is own transfer. Latter process is generally known as natural convection. Every convective process is moving heat partly by diffusion. Another form of convection has been forced convection. In such case fluid has been forced to flow by utilization of a pump, fan or other mechanical means.

Thermal radiation happens via a vacuum or any transparent medium. In electromagnetic waves it usually sends energy through photons.. It has been governed by common laws.[1]

[2] MECHANISM OF HEAT TRANSFER

Fundamental modes in case of heat transfer are as follow:

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Advection: Advection is known as transport mechanism of a fluid from one location to another. It is based on momentum as well as motion of that fluid.

Diffusion or Conduction: Transfer of energy among objects which are in physical contact. Thermal conductivity is considered as property of a material. It is used to conduct heat. It has been evaluated primarily in terms of Fourier's Law for heat conduction.

The Convection: Transfer of energy among object. Environment due to fluid motion is also considered. Average temperature is a reference to evaluate features. It is related to convective transfer of heat.

Radiation: Energy is transferred by emission of electromagnetic radiation.

[3] NEED OF RESEARCH

Due to rising demand of reducing Carbon Dioxide; active global warming gas to prevent global warming, various technologies are advanced to reduce energy year by year for various kinds of equipment like heat generators & boilers, etc. However, independent equipment has its limitation, therefore to achieve carbon dioxide reduction objective.

[4] ABSORPTION HEAT-PUMP

The Absorption Heat pump is to transfer heat from waste heat source in order to raise temperature of hot water that has been supplied. It is helping in energy saving. Process low temperature source has been used to produce chilled water. This system is called chiller system. In process that heat is used to generate higher temperature hot water on other hand. It is called heat-pump system. In this type of heat pump systems the compare heat is reclaimed. It occur using absorption heat pump. It is performed using boiler and additional heat that is needed by absorption system is far less. Absorption system could give much high temperature hot water in comparison of compressor type heat pump system.

Using low temperature waste heat as energy source, system could produce higher temperature hot water. Such high temperature hot water could be used for adding heat to process or flushing process.

Example of Absorption Heat-pump Heat transformer type (for flushing process– Humidification application)

Recovery heat of 90ºC hot water from Co-Generation system to generate & provide 140ºC high temperature hot water or 0.2 MPa steam for production process

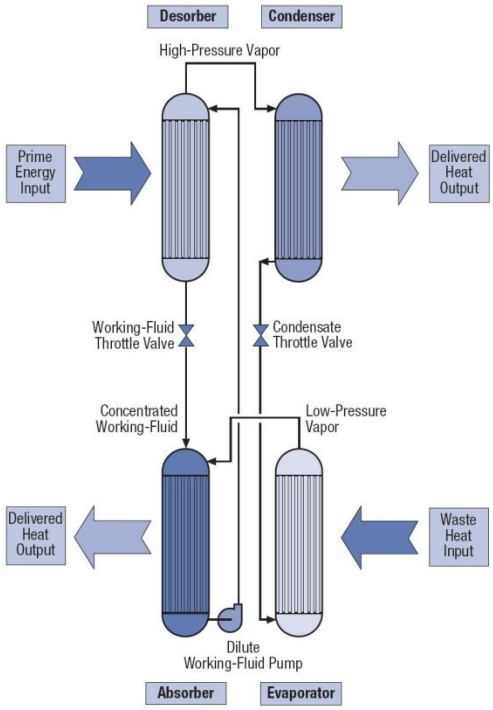

Fig 1. Heat Pump

Machine type

Heat Transformer Type Heat pump
Heating capacity : 300kW
COP: 0.45

Estimate conditions

Steam unit price: 3.5/kg (Boiler steam)
Operation hours per annum: 8,000hours

[5] LITERATURE REVIEW

However there have been several researches that have been performed regarding related work. Some of them have been discussed below.

S.Sekar R.Saravanan, "Experimental studies on absorption heat transformer coupled distillation system "

Vapor Absorption Heat Transformer working with water–lithium bromide solution, coupled with a seawater distillation system of 5 kg/h distilled water capacity has been tested to evaluate its performance. Operating parameters like heat source, condenser, evaporation temperatures, gross temperature lift & feed water flow rate were varied. The influence of these operating parameters on performance parameters namely coefficient of performance, absorber heat load, distillate flow rate, recovery ratio & overall specific thermal energy consumption was obtained. The results of operation of laboratory scale pilot unit shows, that for heat delivery temperatures up to 100 °C, temperature lifts up to 20 °C could be realized. For this system, COP of 0.3 to 0.38 was obtained with maximum distillate flow rate of 4.1 kg/h & a recovery ratio of 0.17 to 0.23, under tested conditions. The distilled water obtained was found to be within permissible limits of features & dissolved salts & solids for potable water.

K. Abrahamsson, G. Aly, A. Jernqvist has written paper on Integration of AHT Process Industry Applications. This research is made in case of Oleochemical Pulp & Paper Industries. This research has made study of incorporating a heat transformer unit in an existing process to increase its energy efficiency. Two various applications such as an evaporation plant in pulp & paper industry & a fat hydrolysis unit in oleo chemical industry, were investigated. In first application, optimal energy conservation strategies were investigated using a heat transformer system incorporated with evaporation plant of pulping process.

A configuration process has designed in evaporation plant for largest energy consumer unit with heat transformer boosting temperature of the last vapor stream from 31°C. It would reduce live steam amount used in this unit by 18.5 %. The pay-off period for the case was calculated such as 4.4 years.

The second application which is available from two flash vessels with saturated water vapour at 100°C,in the fat hydrolysis unit, has been condensed previously in a dump condenser & then discharged. The recovery of almost half this heat as saturated steam at 135°C would be enabled by incorporating a heat transformer unit & it would result in a 1.4 years pay-off period.

One of the vital features of this type of applications is that installing heat transformer unit needs minimum changes in the present plant. Operating the data from two industrial plants has been used in the development of many process configurations.

[6] SCOPE OF RESEARCH

It is important to utilize use all heat energy which is waste from all production facilities in the factories & plants in the system. For achieving this aim some companies are adding new features for the Absorption of Heat-pump and enable a unit to deliver willing high temperature water system which exploits waste heat such as exhaust gas and generates drained water from other production facilities. This system completes a cycle which is favourable & completes good dependability & great efficiency of plants & factories.

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