PANI Water Heater
cum
Energy Saver

Case Study

Content

1. **EXISTING AIR CONDITIONER SYSTEM**

A. Existing air conditioners installed already at site for space cooling

B. Geysers are installed inside the stores to get hot water to store

2. ENERGY EFFICIENT HEAT RECOVERY AND HOT WATER GENERATORS

What is the MWE- Tube to tube heat exchanger?

- This novel vented double wall Tube_Tube Heat Exchanger (Rane and Tandale, 2002) enables exchange of heat between multiple streams. Concern of accidental mixing of the fluids exchanging heat is put to rest with this versatile and reliable heat exchanger.
- A Tube_Tube heat exchanger (TT_HE) is a double wall tubular heat exchanger wherein two or more tubes are placed side by side and bonded thermally using thermal bonding material (TBM)
- For effective transfer of heat. Use of bends and straight lengths in Tube_Tube heat exchanger results in significant enhancement in heat transfer due to secondary flows induced in the bends. The secondary flows induced in bend leads to heat transfer enhancement in bend as well as in straight length downstream of bend without significant increase in pressure drop.
- This simple technology is used to provide hot water for utility and simultaneously citing reduction in the energy consumption of the AC unit using the superheat available at the compressor outlet.

2.1 Some of the basic features of the MWE PANI Water Heater are as under:-

- Compressor discharges gas, this super heat is recovered by PANI.
- At no extra cost or load on power domestic hot water / steam is available in large quantity.
- This will also reduce energy and utility expenses.
- We provide "Super Heat Recovery" feasibility studies and identify opportunities to recover valuable super heat that can be used to lower your energy expenses.
- With MWE PANI can put super heat to useful heat in lowering energy expenses and provide pre-heat, heating.

Impact on Fuel/Electric Usage

- Water Heater/Steam Generator: 100% Fuel Saving
- Chiller/Refrigeration System: 5 to 20% Increase in COP and reduced Electric Usage

Economic Benefits

- **Low Exchanger Cost:** Heat Recovery Units may have Lower Initial Cost Compared to Oil Fired Systems
- **Low Maintenance Charges**: Online, quick, chemical descaling is possible, while the chiller/refrigeration system is in operation
- **Low Payback Periods:** Usually in the Range of 3 to 12 months (without accounting for 100% depreciation)
- **Easy to Maintain:** Can be cleaned-in-situ using Chemical Descaling Fluids while keeping the chillers on line and bypassing the PANI.
- **Low Initial Cost:** uses plain circular tubes without enhancements.
- **Simple to Retrofit:** Only the tube/pipe between compressor and condenser is tapped into to install Super Heat Recovery Pump.
- **High Reliability**: Field-proven patented vented-double-wall Tube to Tube Heat Exchangers TT_HE is used to assure contamination free hot and cold water delivery
- **Low Internal Volume**: fast start-up; hot and cold water generation in a few minutes
- **Durable**: no worries about contamination of water and water tank pressurization
- **Non Water Contamination: Most heat Generator water heaters use a single wall heat exchanger for exchanging heat between the refrigerant and water being heated. This poses the danger of the water getting contaminated by the refrigerant which is not desirable.**
- **Intelligent Application engineering:-** There will be no wastage of water and waiting time to get hot water at the taps as the MWE PANI's and the unique water tank and piping configuration ensures hot will flow almost immediately from the tap.
- **Integrated Intelligent Information System:-**
    - The system will be so custom designed that it will be integrated with Scada (**supervisory control and data acquisition system**)
    - Our intelligent Scada system will **monitor the energy consumption, flow and usage of hot water.**
    - System is engineered to monitor and operate the heat pumps depending upon the demand to conserve energy.
    - Data of usage and consumption will be available in digital format.
    - A complete alert mechanism is activated in case of abnormal variations.
    - Our IIIS is web enabled, performance is monitored by our technical team and alert mechanism as per customer's choice can be provided.

Particulars	Heat Exchangers with ΔT of 5°C to 10°C	Tube tube heat exchangers (tthe) with 20°C to 40°C
Instant Hot / chilled water	Not possible	Streams of Hot water available within seconds
Recirculation of Pump	Mandatory	Not required
Pumps Required in non pressurized system	Primary and Secondary pump required of higher capacity due to higher flow rate of water	Only Primary Pump required to put the hot water in tank.
Pumps required in pressurized system	Secondary pump required	No pump Required
Storage Tank	Mandatorily required to recirculate the water to achieve desired temperature	Optional
Feed Water for Boiler at70°C	Not Possible	Possible in single pass taking water at 20 °C and delivering upto 70 °C
Power saving	Overall COP is less if all pumping power consumption is considered.	Overall COP is high even is pumping cost is considered.

3. PERFORMANCE TEST READINGS :

Date	SHR_WH status	Time of operation	Total energy consumed	Total power consumption	Net cooling load	Average COP
	ON / OFF	hr	kWh	kW	kWh	#
14/08/13	ON	17.75	65.18	3.67	8.41	2.69
15/08/13		17.50	64.63	3.68	7.94	2.52
19/08/13		16.00	56.46	3.55	6.61	2.31
Average		17.08	62.09	3.63	7.65	2.50
22/08/13	OFF	15.92	54.49	3.41	5.68	1.80
24/08/13		16.67	50.81	3.05	5.13	1.90
25/08/13		13.08	37.37	2.92	3.90	1.94
Average		15.22	47.56	3.13	4.91	1.88
% increase				16.05	56.02	33.03

4. INSTALLATION PHOTO :


HOT
Water
OUT

5. RETURN ON INVESTMENT :

INPUT	Quantity of hot water required in liters	1300.00
	Inlet Water temp. In C	45
	Out let water temp. Required in C	65
	AC COP without PANI	1.94
	AC COP with PANI	2.69
	Cooling load in kWh	8.41
	AC operating hour	16

Saving with Alternative Fuels

Efficiency (in %)				70	75	35	35	35	70
Parameter	AC with PANI	AC Normal	Electric Geyser	Diesel	LPG	Coal	Charcoal	Wood	Natural Gas
Calorific value (kcal/kg)				10700.00	11600.00	5015.00	7069.00	3749.00	6675.50
Heat Required in kcal.	26000		26000	26000	26000	26000	26000	26000	26000
HEATING REQUIREMENT kWh	50.02	69.36	30.23						
Heat delivered per kg				5243.00	8700.00	1755.25	2474.15	1312.15	4672.85
Total fuel required in kg				4.96	2.99	14.81	10.51	19.81	5.56
Cost/unit	6.00	6.00	6.00	58.00	78.00	4.00	12.00	4.00	28.00
Total cost PER day	0.00	416.16	181.40	287.62	233.10	59.25	126.10	79.26	155.79
Saving per day		116	297	404	349	175	242	195	272
Saving per year			1,04,099	1,41,278	1,22,197	61,349	84,747	68,352	95,139

6. RESULT:

Using this system 1300 litters of hot water was produced with added saving in power consumption of 24.7% was recorded in the case study.