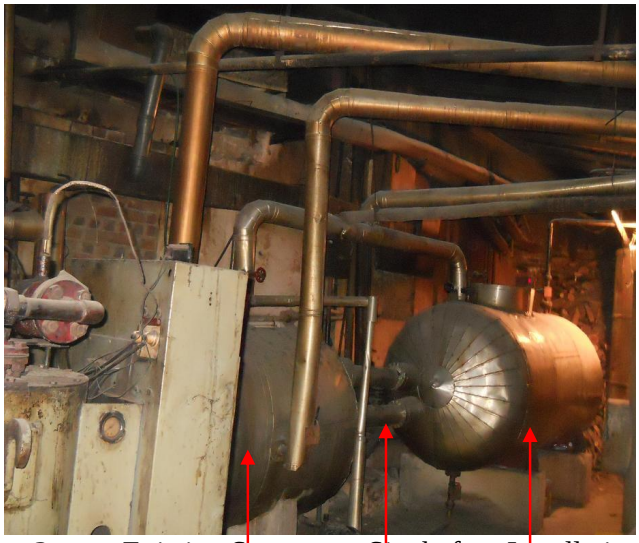
Dew Heat Pump
for
Heating Water

Case Study

Content

1. EXISTING SYSTEM INTRODUCTION



2. Existing Systems at Site before Installation

A. Latest diesel fired boiler

B. 25 years old diesel fired boiler

C. 2000 liters Tank

D. Connecting Pipes

E. Wood fired boiler

F. 3000 liters Tank

2. MULTI-UTILITY ENERGY EFFICIENT HEATGENERATORS

Simple things and technology often work best and so it is here. Using the proven principles of refrigeration and air conditioning, cooling and or heating effects can be simultaneously delivered if required. In addition to the cold utility generated from the evaporator side heat from the condenser can also be delivered as a hot utility. Condenser heat is approximately the sum of the energy supplied to the compressor and the heat gained from the cold utility in the evaporator. Heat exchanges are enabled using patented Tube-Tube Heat Exchanger Technology which is patented. Heat Generator technology has been used in air conditioning globally for more than 50 years and our technology is also well proven. The MWE Multi Utility Heat Generator is at the leading edge in terms of energy efficiency and durability in all weather conditions. The system uses a high performance system configuration and components along with the Vented-Double Wall TT_HE Technology to enable direct integrating with the potable water streams or process fluid streams to enable high COP and reduced CO_2 emissions.

2.1 Some of the basic features of the MWE DEW_HP are as under:-

- **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
- **Energy Efficient**: can heat tap water from 27 to 57 to 60^{o}C with a heating Coefficient of Performance (COP_h), typically in the range of 3 to 4; while simultaneously cooling air from 25 to 18^{o}C; overall energy saving would be over 66 to 75% when compared with electric water heating and conventional air conditioning
- **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 or cold water at the taps as the MWE DEW_HPs and the unique water tank and piping configuration ensures cold or hot will flow almost immediately from the tap.
- **Surplus cooling** effect can be delivered as Air Conditioning FCUs,
- **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, pressure and usage of hot and chilled 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 :

Hotel Hiltone Mount Abu, Heat Pump Test Readings and Results

Date	Symbol	Units	10/11/2012				11/10/2012			
Time		Hr	1400	1510	2015	2100	730	815	910	1100
Water flow	$W_{.cnd}$	lpm	14	14	14	14	13.1	13	13	13
Condenser Inlet water temperature	$t_{cnd.i}$	^{0}C	37.1	35.7	33.7	39.3	30.4	28	26.8	38.6
Condenser outlet water temperature	$t_{cnd.o}$	^{0}C	56.5	53.9	51.6	56.4	49.1	47.2	46.2	58.1
Heat load	Q_{cnd}	kW	18.92	17.75	17.46	16.68	17.07	17.39	17.57	17.66
Tank temperature at indicator	t_{tank}	^{0}C	**46.10**	**43.70**	**45.80**	**47.80**	**30.90**	**29.50**	**29.80**	**42.60**
Inlet air temperature	$t_{evp.i}$	^{0}C	20.4	21.5	17.5	15.8		15.6	16.7	19.1
Outlet air temperature	$t_{evp.o}$	^{0}C	15.2	16.2	13.1	12.4	14.1	12.5	14.5	12.2
Evaporator pressure	p_{evp}	psig	75	75	70	72	70	68	70	75
Condenser pressure	p_{cnd}	psig	320	315	295	330	280	260	260	290
Voltage	$RY_{.cmp}$	V	377	380.6	372.2	368	354	348	357	362
	$YB_{.cmp}$	V	374.9	375.3	369.1	366	348	348	350	356
	$RB_{.cmp}$	V	376.9	376.8	373	369	348	352	348	360
	$Avg_{.cmp}$	V	376.3	377.6	371.4	367.7	350.0	349.3	351.7	359.3
Current	$RB_{.cmp}$	A	7.9	8.1	7.9	7.5	7.7	7.5	7.7	8.2
	$YB_{.cmp}$	A	7.5	7.8	7.1	7.7	7.1	6.6	6.6	7.8
	$B_{.cmp}$	A	7	6.5	6.7	7.7	6.3	6.6	6.6	7.1
	$Avg_{.cmp}$	A	7.47	7.47	7.23	7.60	7.03	6.90	6.97	7.70
Power Compressor	P_{cmp}	kW	**3.89**	**3.91**	**3.72**	**3.87**	**3.41**	**3.34**	**3.39**	**3.83**
Power Fan assumed	P_{fan}	kW	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Power Pump	P_{pump}	kW	0.422	0.44	0.42	0.41	0.50	0.43	0.48	0.42
Voltage	$V_{.pmp}$	V	211	211	208.6	206.5	196	198	198	202
Current	$A_{.pmp}$	A	2.5	2.6	2.5	2.5	3.2	2.7	3	2.6
Cop cmp			4.86	4.54	4.69	4.31	5.00	5.21	5.18	4.61
COP with fan			4.31	4.03	4.13	3.81	4.36	4.53	4.51	4.07
COP with pump			4.39	4.09	4.22	3.89	4.36	4.62	4.54	4.15
COP overall			**3.93**	**3.66**	**3.76**	**3.49**	**3.87**	**4.07**	**4.02**	**3.71**

4. INSTALLATION PHOTO :

5. RETURN ON INVESTMENT :

INPUT	Quantity of hot water required in liters	10000
	Inlet Water temp.	25
	Out let water temp. Required	60
	COP	3.8

Efficiency (in %)			85	35
Parameter	Heat Generator	Electric Geyser	Diesel	Wood
Calorific value (kcal/kg)		860.00	10700.00	3749.00
Heat Required in kcal.	350000.00	350000.00	350000.00	350000.00
KWH HEATING REQUIREMENT	107.10	406.98		
Heat delivered per kg			7730.75	1312.15
Total fuel required in kg			45	266.74
Cost/unit	7.00	7.00	58.00	5.00
Total cost PER day	749.69	2848.84	2625.88	1333.69
Saving per day		2099.14	1876.18	583.99

The system operates 24*7 and the capital cost of Equipment was Rs. 3.25 Lakhs. The payback with wood burner has been less than 15 months and with Diesel calorifier it has been less than 7 months.