Summary of study: EHP for Dairy: Unit - 8

Industry : Dairy

Unit profile : A dairy plant located in Gandhinagar (Gujarat) manufacturing various milk products, milk powder, cheese, etc.

Technology : Water-heat source electric heat pump (EHP)

Year of investigation : 2012

Application-1: Cooling and heating water in a dormitory or canteen

Key features:

			Proposed System
EHP	Hot water inlet	ºC	30
	Hot water outlet	ºC	60
	Hot water flow rate	m^3/hr	1.8
	Cold water inlet	ºC	12
	Cold water outlet	ºC	7
	Cold water flow rate	m^3/hr	9.0
	Heating capacity	kW	73.6
	Cooling capacity	kW	52.4
	Power consumption	kW	23.4
	COPt	-	5.4

Energy saving and CO_2 reductions:

Parameter	Unit	For single EHP
Electricity unit price	Rs/kWh	6.00
Natural gas unit price	Rs/Sm^3	36.00
Number of operating hours per year		3000
Annual energy cost reduction (Lakh Rs)/reduction rate (%)		1,081,173 / 72%
Annual CO_2 reduction (t-CO_2)/ reduction rate (%)		56 / 48%

Application-2: Cooling milk bulk cooler and hot water for cleaning and washing

Key features:

			Proposed System
EHP	Hot water inlet	ºC	30
	Hot water outlet	ºC	90
	Hot water flow rate	m^3/hr	3.8
	Heating capacity	kW	262.0
	Cooling capacity	kW	174.4
	Power consumption	kW	98.4
	COPt	-	4.1

Energy saving and CO_2 reductions:

Parameter	Unit	For single EHP
Electricity unit price	Rs/kWh	6.00
Natural gas unit price	Rs/Sm^3	36.00
Annual energy cost reduction (Lakh Rs)/reduction rate (%)		378,290 / 43%
Annual CO_2 reduction (t-CO_2)/ reduction rate (%)		19 / 43%

Application-3: Recovery of heat from cooling water of ammonia refrigeration compressor, heat cooling water of generator equipment and supply hot water to CIP

Key features:

			Proposed System
EHP	Hot water inlet	ºC	40
	Hot water outlet	ºC	90
	Hot water flow rate	m^3/hr	1.29
	Cold water inlet	ºC	30
	Cold water outlet	ºC	25
	Cold water flow rate	m^3/hr	8.85
	Heating capacity	kW	75.0
	Cooling capacity	kW	51.4
	Power consumption	kW	27.2
	COPt	-	4.64

Energy saving and CO_2 reductions:

Parameter	Unit	For single EHP
Electricity unit price	Rs/kWh	6.00
Natural gas unit price	Rs/Sm^3	36.00
Number of operating hours per year		3000
Annual energy cost reduction (Lakh Rs)/reduction rate (%)		35,775,376 / 57%
Annual CO_2 reduction (t-CO_2)/ reduction rate (%)		813 / 17%

Note:
This report is an example for investigating the potential of application of Japanese low carbon technology (LCT) in Indian industries. EHP is the LCT which can generate greater benefits by the conditions for use of the outside temperature, the incoming water temperature, and the cold water temperature, etc, since the performance will increase/decrease depending on the conditions.