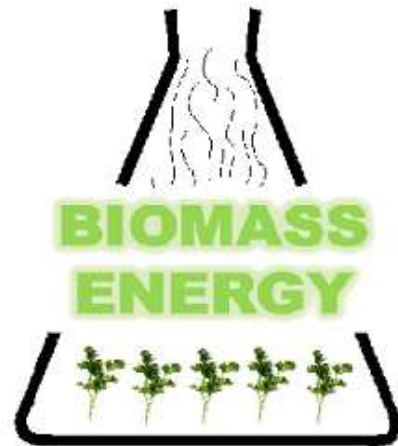


CASE STUDY

BIOMASS OR ELECTRIC

The logo for SANYO, featuring the word "SANYO" in a bold, red, sans-serif font. The letter "A" is stylized with several vertical lines of varying lengths passing through it.The logo for Solar District Cooling (SDC), consisting of the letters "SDC" in a bold, blue, sans-serif font.

Solar District Cooling

Solar District Cooling Sdn. Bhd. (607017-T)

Suite G.2, Ground Floor, No. 2A, Jalan BP 4/6, Bandar Bukit Puchong Industrial Park,
47120 Puchong, Selangor Darul Ehsan, Malaysia.

Tel: + 603. 8062. 2237

Fax: + 603. 8068. 6124

Email: enquiry@sdc.my

Web: www.sdc.my

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ASEAN Energy Awards 2009

1.0 Introduction:

- a. Project: Replacement of aged electric chiller with absorption chiller
- b. Background: The management had the intention to reduce their operating cost, and start looking ways to start. They target the chiller as it's the largest electricity consumption equipment. Currently, the electric chiller has been operated for the past 12 years, and the management decided to look for alternative solution.
This factory is generating steam, due to the availability of steam supply in the premises and is inexpensive; the management is considering changing to steam-fired absorption chiller

2.0 Energy Consumption Analysis:

Description	Water Cooled Chiller System	Steam Fired Absorption Chiller System
Equipments:	Centrifugal Electric Chiller	Sanyo Steam Fired Absorption Chiller
	Chilled Water Piping	Chilled Water Piping
	Cooling Water Piping	Cooling Water Piping
Capacity		
Cooling Capacity of Chiller (USRT)	450	450
Model	Nil	NG-E41H
Steam Pressure	Nil	8 kg/cm ² .G
Steam Consumption	Nil	1,769 kg/h
Steam Temperature	Nil	175°C
Quantity (Nos)	1	1
Total Cooling Capacity (USRT)	450	450
Coefficient of Performance (COP)	5.4	1.37
Electricity Consumption (1 Day)	Daily Energy Consumption	Daily Energy Consumption
Chiller (kWh)	7,020	134
Chilled Water Pump (kWh)	1,207	1,207
Cooling Water Pump (kWh)	907	1,198
Cooling Tower Fan (kWh)	365	568
Total Consumption (kWh)	9,499	3,107



3.0 Operating Cost Comparison:

Description	Water Cooled Chiller System	Steam Fired Absorption Chiller System
Electricity Consumption (1 Day)	Daily Energy Consumption	Daily Energy Consumption
Chiller (kWh)	7,020	134
Chilled Water Pump (kWh)	1,207	1,207
Cooling Water Pump (kWh)	907	1,198
Cooling Tower Fan (kWh)	365	568
Total Consumption (kWh)	9,499	3,107
Electricity Tariff		
Category	Tariff E3-Customized	Tariff E3-Customized
Peak Period (RM/kWh)	0.275	0.275
Off Peak Period (RM/kWh)	0.168	0.168
Maximum Demand (RM/kW)	28.34	28.34
Annual Electricity Cost		
Consumption (kWh)	3,466,770	1,134,055
Cost (RM)	933,389.00	305,334.00
**With 365 working days a year, 24 hours running.		
Annual Steam Cost (Biomass)		
Cost (RM/ton)	Nil	25.00
Consumption (ton/h)	Nil	1.769
Total consumption (ton/year)	Nil	15,496.44
Total cost (RM/year)	Nil	387,411.00
**With 365 working days a year, 24 hours running.		
Operating Cost (1 year)		
Electricity cost (RM)	933,389.00	305,334.00
Biomass cost (RM)	Nil	387,411.00
Total operating cost (RM)	933,389.00	692,745.00



4.0 Investment Cost:

Description	Water Cooled Chiller System	Steam Fired Absorption Chiller System
Investment cost		
Budgetary investment cost (RM/USRT)	Nil	2,500.00
Investment cost (RM)	Nil	1,125,000.00
Capital Allowance @ 25% (RM)		281,250
Investment Tax Allowance @25% (RM)	Nil	281,250
Total investment cost (RM)	Nil	562,500
Operating cost saving per year		
Saving (RM)	Nil	240,644.00
Saving (%)	Nil	26%
Return of Investment		
Investment Cost Payback Period based on operating cost only	Nil	2.3

With the consideration to invest and change the electric chiller later, the owner decided to switch to absorption chiller. The investment on steam fired absorption chiller of RM 1,125,000.00 can be recovered via the saving in operation cost with simple payback of 2.3 years.

5.0 Benefits of Operate Absorption Chiller :

- a. **Lower Cost of Ownership**
Electric chiller with compressor rotates at high speed, creating extensive wear and tear. Whereas absorption chiller works by maintaining vacuum condition at evaporator with absorption cycle, thus much lesser moving part. As a result, less noise, less vibration, and least maintenance.
- b. **Minimum Operation Cost**
Cost of biomass steam generated from this factory for absorption chiller is cheaper to operate absorption chiller than electricity for electricity chiller.
- c. **Minimum Maintenance Cost**
The owner is currently paying RM 3,500/month for the comprehensive maintenance on the 12th year's old chiller, changing to absorption chiller the owner can have more than 40% saving on maintenance cost.

